LIGHTING

GROWTH

The growth of leaves and roots must keep a
balance if a plant is to thrive. Many a promi
flourish of foliage has withered to nothing thro
insufficient root formation.

The present-day expansion in the use of elec
lighting is no top-heavy growth for it is based o
lamp industry whose roots are deep and consta
developing.

The research organisations of members of E.L.M
are ceaselessly exploring new ground and prob
for fresh improvements. This basic work is
valuable and its results are to be seen everywh
On it rests the success of every lighting applicat
and so long as it is as skilfully handled as it
today by members of E.L.M.A., it is certain that
demands of those who apply lighting will be
by an imaginative and sympathetic response fr
those on the research and manufacturing sides
the British lamp industry.

*Philodendron Ilsemanni. A near relation of the popular '
leaf' philodendron, this plant comes from South America.
dark green leaves have ivory markings and, with mode
watering, it will grow happily in most interiors as long as
kept free from dust.*

**The ELMA Lighting Servi
Bureau, 2 Savoy Hill, London, W.C**
is maintained by the manufacturers
the following brands of lamps:—

Osram · Mazda · Royal 'Ediswa
Siemens · Crompton
Metrovick · Elasta · Crysel

Vol. 49. No. 6. June, 1956

LIGHTING

Published by The Illuminating Engineering Publishing Co. Ltd. on the 1st of each month at 32, Victoria Street, London, S.W.1. Telephone: ABBey 7553. - Subscription rate 25s. per annum.

contents

143 Editorial

144 Notes and News

147 The Role of Light in Places of Worship Throughout the Ages, by Manford Belmore

151 The Lighting Engineer's Approach to the Lighting of New Churches, by M. W. Peirce and J. M. Waldram

157 The Architect's Approach to the Lighting of New Churches, by Edward D. Mills

163 The Re-lighting of Old Churches, by D. W. Tyrrell

171 Lighting Abstracts

172 I.E.S. Activities

176 Postscript by "Lumeritas"

Church Lighting

THE problem of lighting churches in a fitting manner is not an easy one, despite the resources now available to the lighting designer. Perhaps the difficulties are least in churches of contemporary design and construction, but they are certainly formidable in many historic churches. Criticism has not been lacking of the methods of lighting adopted in some of our churches which have undergone restoration after war damage, as—for instance—St. James's in Piccadilly, nor, indeed, of new installations in other more fortunate but architecturally very different churches. Some of our finest medieval and Renaissance church buildings are still starkly lighted by pendant bare lamps, either singly or in clusters. Churches challenge the imagination and skill of lighting designers and, although this challenge has been met successfully here and there, it still remains all too widely. In this special church lighting issue we publish articles which should prove stimulating and helpful to all who are interested in this field of lighting.

Notes and News

AT the extraordinary general meeting of the IES held at Harrogate on May 11 resolutions to amend the by-laws of the Society in connection with annual subscriptions and the overseas class of membership were submitted. The nature of the resolutions was given in the March issue. The resolutions received the support of more than three-quarters of those present at the meeting, so that annual subscriptions to the Society now become: Fellows, £4 10s.; Corporate Members, £3 10s.; all Students, £1, and the minimum annual subscription for Sustaining Members becomes 7 guineas. The class of Overseas Member is discontinued.

Many will no doubt be sorry that there will no longer be a special class for those living overseas, but with rising costs the economic subscription for such members is so close to that of Corporate Members that it is difficult to justify a separate class with a lower rate of subscription. It is hoped that these members will transfer to the Corporate Member class and thus maintain their connection with the Society from which they undoubtedly derive benefit.

The resolutions on subscriptions were passed only after the case for no increase or a lesser increase than that proposed by the IES Council had been put by a number of members from the Centres. One argument was that membership would be adversely affected. With any cultural society this is bound to be so for a time; the loss in membership which might result is unlikely, however, to be serious and will in all probability be recovered during the next year or two, during which time the Society as a whole (including the Centres) will be enabled at least to maintain its present services to members (instead of restricting them, as would have been inevitable at the former rate of subscription), and will no doubt be able to improve on them and be in a much stronger position than it now is.

An amendment to the resolutions proposed an increase of only 10s., and suggested that the *Transactions* be made available at a separate charge only to those members who wish to receive them. The argument was that only a small proportion of members wish to receive the *Transactions*, and the cost of production in supplying the needs of these members only would result in a large saving. This, however, is not true. With a publication such as the *Transactions*, which has a circulation of about 3,000, the saving on paper and machining which would result from printing, say, 500 copies instead of 3,000 is quite small, the bulk of the cost being in setting the type, this cost being the same whether the number of copies is large or small. If the number printed is small it follows that the cost per copy must be higher. The amendment received little support.

A most surprising contribution to the discussion was the expression of disappointment at the attitude of London (*sic*) towards the Centres. Bearing in mind that all Centres are represented on the IES Council, that the President and Vice-Presidents visit the Centres during their terms of office (often at great inconvenience and expense), and that the Centres are left to run their own affairs without any interference from " London," it is difficult to interpret this remark. We have reason to believe that it is not the view of all Centres.

The great majority of those present at the meeting were provincial members from all parts of the country. It is reasonable, therefore, to assume that the decision of the meeting is representative of the views of members as a whole.

Dow Prize Competition

The results of the 1955 Dow Prize Competition have been announced by the IES. Entrants were asked to submit essays under the title " How I look at lighting engineering," in which they were given the opportunity of discussing their individual approach to lighting engineering and of putting forward their own ideas as to the scope and methods of the lighting engineer. Participation in the competition is limited to members of the IES. There were eight entries.

The result is that the first and second prizes (25 and 15 guineas respectively) are to be divided equally between Mr. R. W. Taylor and Mr. C. Stuart; the third prize of 10 guineas is awarded to Mr. Derek Phillips, and a commendation is awarded to Mr. E. Harrison Jones. The prizes will be awarded at a meeting of the Society to be held at the Royal Institution on October 9. Summaries of the winning essays will appear in *Light and Lighting* in due course.

Eyestrain in Cinemas

In 1919 the Illuminating Engineering Society received a request from the London County Council for advice on the possible causes of eyestrain in cinemas. The Society set up a committee including

representatives of the L.C.C., the cinema industry, the medical and ophthalmic professions, and of the Society, to look into the matter. The report of this committee was published in 1920 and the recommendations contained therein have since then been incorporated in the regulations of licensing authorities.

With the introduction of new techniques of cinematograph exhibition the Society was approached by a number of licensing authorities regarding possible revisions to the 1920 recommendations. The Council of the IES set up a new committee under the chairmanship of Dr. W. J. Wellwood Ferguson (an ophthalmic surgeon and a past-president of the IES) to reconsider the 1920 report and to state what amendments, if any, should be made to the 1920 recommendations. The committee includes representatives of the IES, the Faculty of Ophthalmologists, the London County Council, the British Kinematograph Society and the Physiological Society.

The committee began its study in September, 1953, and issued an interim recommendation in February, 1954. The committee has visited a large number of cinemas to study the techniques introduced during the last few years, and has made a special film to enable the study of certain aspects in greater detail than is possible when viewing normal commercial films. The committee has studied the seating arrangements in theatres and through Mr. Weston (a member of the committee) has carried out research into viewing conditions.

The report of the committee is now being prepared and will be submitted to the Council of the IES in due course. In the meantime the recommendations of the committee are as follows :—

(1) In order to prevent undue discomfort and fatigue of the eye muscles when viewing cinema pictures, the angle of elevation subtended at the eyes of any seated viewer by the length of the vertical line dropped from the picture top-centre to the horizontal plane passing through the viewer's eyes should not exceed 35 deg., the position of the viewer's eyes being assumed to be 42 inches above floor-level and 6 inches in front of the back-rest of the seat.

(2) Effect should be given to Recommendation 1 in all premises erected or adapted as cinemas after the date of issue of these recommendations.

(3) Effect should be given to Recommendation 1 in premises which, at the date of issue of these recommendations, are already in use as cinemas, except that where, for structural and economic reasons, it is not reasonably practicable in such premises, including those used only occasionally for cinematograph exhibitions, to avoid exceeding the maximum angle specified in Recommendation 1, an increase in the angle of elevation to the picture top-centre may be permitted up to a maximum of 45 deg. provided that the angle of elevation to the mid-point of the picture does not then exceed 30 deg.

(4) During cinematograph exhibitions organised wholly or mainly for children in any premises as defined in Recommendations 2 and 3, effect should be given to Recommendation 1, if necessary by preventing occupation of any seats from which the angle of elevation of the picture top-centre exceeds 35 deg.

The committee has considered the recommendation made in 1920 concerning a limit to the permissible angle of view to the sides of cinema pictures. It is felt that while the picture may be distorted when viewed at an acute lateral angle, it is probably less important for the prevention of viewer discomfort to place a limit upon this angle than upon the angle of elevation. There is, in fact, not sufficient evidence at present to justify the recommendation of a definite limit to the lateral angle of view and, accordingly, it is suggested that the 1920 recommendation on this matter be waived for the time being.

Summer Meeting

Having used up most of our space with I.E.S. matters we might as well keep to the same track, particularly when we have such a subject as the recent Summer Meeting to discuss.

After each such meeting we seem to report that it was the best ever. At the risk of being monotonous (after all, it is two years since we last said it), we have to report once again. and here we are quoting what seems to be a unanimous view, that the Harrogate meeting set yet a higher standard and was enjoyed by all who took part.

The papers were very good indeed. Strange and Hewitt opened with a performance that started the meeting perfectly, and Durrant brought the meeting to a close with a paper which was superbly presented. In between these we had papers which, whilst not lending themselves so readily to demonstration, nevertheless held the attention of delegates and gave rise to very good discussions.

Once again a display of new lighting equipment was an important feature. We have heard varying comments on this. Some appear to have been disappointed that there were not more new things to be seen, whilst others thought it a very worth-while display. The arrangement of the display was, in our opinion, much better than on the previous occasion as there was more space and more time for people to wander around to examine things. We hope the display will never grow into an exhibition, but we also hope that, as more I.E.S. Sustaining Members take part, as we feel they will, the informal atmosphere, which is typical of the Summer Meetings, will be retained.

It was also pleasant to meet so many people from other countries. They came from as far afield as Australia and the Transvaal; we were also glad to hear some of them taking part in the discussions on the papers.

A full report on the meeting will appear in our next issue.

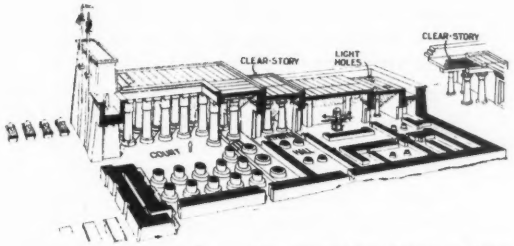
Says Manford Belmore in the essay which, on the opposite page, starts this special Church Lighting issue, "This century's great advances in building construction enable us to emulate and surpass the finest daylighting effects of the past." He gives the crematorium chapel at Abo, Finland, seen in the photograph above, as an example of how, in modern buildings, lighting considerations can modify freely the shape of the plan—in this instance "to enable light to flood the apsidal wall from a mysterious hidden source at the side."

(Photograph by Ternia Midgley)

By Manford Belmore

THE ROLE OF LIGHTING IN PLACES OF WORSHIP THROUGHOUT THE AGES

COLOUR and movement, painted mask and ritual dance may have moved pre-historic man in his torch-lit cave, may to this day excite primitive man to religious frenzy in the flickering, filtered light of the jungle clearing; but, though they appeal to the eye, they cannot be said to involve the conscious manipulation of light. For the phenomena of nature had first of all to be systematically observed if man were to make more than the most cursory and accidental use of them. Among these phenomena few can have seemed more momentous than the return of spring and summer, the mysterious peregrinations of the moon, and the recurrent motions of the stars. On them depended comfort and harvest, movement and navigation, and it is not surprising, therefore, to find their study the jealously guarded preserve of a sophisticated priesthood, nor to see that priesthood bending a considerable proportion of the community's resources to the erection of instruments for the study of the laws of light—instruments which were, at the same time, monuments for their celebration. Thus, by 3000 B.C., we see the Assyrian priest making astronomical observations atop his Ziggurat, and by 2000 B.C. another priest, at Stonehenge, waiting for the rising sun to glow at the predicted hour, down the central avenue on Midsummer's Day. No doubt the worshippers were awed when this happened, but what they saw was light—not *lighting*. The first civilisation deliberately to manipulate light to make an emotive and symbolic impression on the worshipper was the Egyptian: from the blazing, treeless plain, after the noisy procession, the coloured flags and the long avenue of sphinxes, you enter the colonnaded forecourt in the shadow of the huge pylons, and penetrate according to rank into the dim, mysterious forest of lotus- and papyrus-shaped columns in the hall beyond, while the god's last cell—very small, very low, and very dark—is entered by Pharaoh alone. While the design of the Egyptian temple rigidly dictated the axis of approach, the Greek temple stands free on its hill, subtly related to a landscape " carved in its own light," and the approach to it—the approach of a more joyous, free, enquiring people—is by a zigzag road up the mountain, offering ever-differing perspectives. On the Acropolis itself, the various buildings—Parthenon, Propylaea, and Erechteon—and the statue of Athena stand in happily considered asymmetry. Centuries were to elapse before artificial lighting was to play any significant role in the design of places of worship, but the Greeks certainly understood the manipulation of natural light—from the contrast of carved and smooth in the entablature, the gradations of light and shade in grooved triglyph and fluted column, the shadows of the colonnade moving along the inner wall, and the reflected light cast on the sculptured frieze high upon it, to the shadowy interior, with the statue of the god or goddess, off-centre beside the altar and lit by a skylight. It is instructive to contrast this achievement of harmony and clarity with two other civilisations which built on hills under clear skies: the proliferation of indiscriminate detail on the temples of India, and the deep-cut carvings of the Aztecs, of a harshness and inhumanity to match the cruelty of their rites. With the Romans, whose genius ran more to law-giving and works of engineering, much of Greek subtlety is lost: orientation is replaced by the confusion of a temple-crowded forum in the valley, the all-round stepped base is replaced by a single flight of steps, the columns are half-swallowed by the walls, and a luxuriance of naturalistic ornament supersedes contrast and compelling unity. Meanwhile, underground, a great and lasting

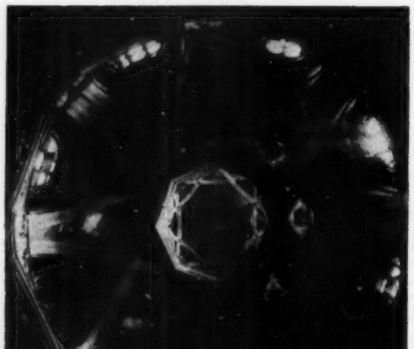


". . . dim, mysterious forest of lotus- and papyrus-shaped columns."

". . . subtly related to a landscape carved in its own light."

" draw in the worshipper with their huge rose windows."

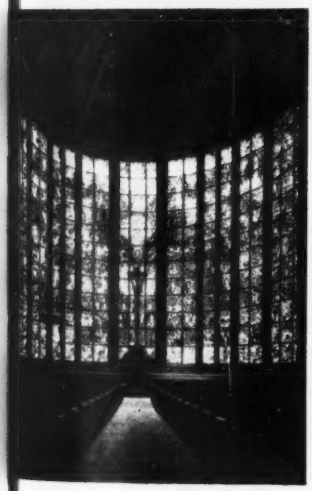
religious light was preparing to shine on the world, and the little oil lamp used to light the meetings of the earliest Christians has remained a powerful symbol to this day. With the establishment of Christianity as a state religion, the worshippers and their churches emerged above ground and, though their technical means were primitive, though they employed the columns of Roman temples and often the very temples themselves, they achieved in their basilicas a new and impressive simplicity. As with the Egyptians, the emphasis is on the interior of the building, the approach axial, and the articulation hierarchic. " The church is taken as the visible symbol of the way of the faithful towards the mystery of the Real Presence. The altar under the apse and the miracle of the Real Presence are the goal." To reach it we cross the open forecourt and the porch, and enter the long nave separated from its aisles by rows of columns uninterrupted by transepts. Above, clerestory windows march with similar monotony, the clear white light models the simple sculpture of the choir rails, and the eloquent slope of the stone lectern is echoed by the double balustrade to the pulpit, until we reach at last the rounded apse with its grave mosaic. The early Christian basilica contained the germ of widely divergent developments in East and West. In the East, it is mosaic which triumphs and, in dimly lit splendour of blue and gold, comes to cover walls and domes of increasing spatial complexity, grouped about a central plan. It is, moreover, to the Greek Orthodox Church that we owe one of the most telling liturgical uses of artificial light : at Easter the church is lit by only one or two tapers ; the congregation hold unlit candles in their hands and, at a point in the service, they go out into the street, light their candles there, and re-enter the church, which is now ablaze with light. " Christ is indeed risen ! " In the West, the painted or mosaic saints between the windows detach themselves as statues ; and West front and porches, also, are enriched with sculpture and draw in the worshipper with their huge rose windows. The columns climb up the hitherto flat walls and finally join in roofs of complicated vaulting, while between them the windows grow larger and larger, and become, with their stained glass, richly coloured biblical picture-books, culminating in such " all-glass " daring as the 13th-century church of Ste Chapelle, Paris. The Gothic impulse spent, it was in 15th-century Italy, whose Gothic had never soared, that the movement of renewed enthusiasm for the literary, philosophical and architectural monuments of antiquity known as the Renaissance matured. The God of these early humanists was not Justinian's God of Wrath, nor was he altogether St. Francis' God of Love : he was pre-eminently the Creator, a god of perfection. Accordingly the aim of the Renaissance architect is a building free of all Gothic accidents and excrescences, symmetrical in all its parts, its proportions based throughout on mathematical or even musical laws. This ideal—which, incidentally, was shared in many respects by the mosque-builders of the great Moslem expansion six centuries earlier—found its happiest expression in the central plan of a perfect prism topped by a flawless dome, of which the supreme example was intended to be St. Peter's in Rome. It is not surprising that the illumination considered most suitable for such a church should be, once more, a clear white light : there is no room in the Renaissance for soaring height and mystic glow. This high summer of belief in clarity and the supremacy of reason was not to last. The turmoil of the Age of Discovery, of Reformation and Counter-Reformation, shook established norms and the established faith to their foundations, and there ensued that period of doubt and pessimism of which the aesthetic expression is known as Mannerism. The worshipper in a church of this period is not given clarity and harmony : he is puzzled, frustrated and perplexed. For the first time, " certain important features are introduced into the composition exclusively to make light effects possible " : one has only to see how, in the mid-16th-century church of Il Gesú, Rome, the lighting of the last bay of the nave is darkened dramatically before the climax of bright light streaming down from the cupola over the crossing. With the impetus of the Counter-Reformation, the Catholic countries of Europe knew a resurgence of optimism which, in the hands of such Baroque architects as Bernini and Borromini, the Asam brothers or Balthasar Neumann, attained a synthesis of the arts and a unity of effect not known since the highest achievements of the Gothic period ; nor, if with greater sobriety, is a Protestant echo lacking in the white and gold splendour and the spatial brilliance of Wren. In a Baroque church,



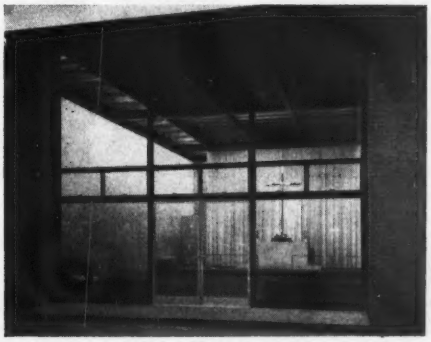
" . . . the sky itself appears to have been captured in an eightfold lattice of ribs."

". . . to concentrate the light to fall on the altar from above."

architecture merges with sculpture, sculpture with painted ceiling, which itself presents the illusion of an open sky in which saints and angels soar heavenwards in an eloquent flurry of draperies. Or, as in the church of S. Lorenzo, Turin (architect, Guarini), the sky itself appears to have been captured in an eightfold lattice of ribs. It is the great age of theatre, and unashamedly theatrical are the devices employed to heighten the emotional effect on the worshipper : the illusionist carving ; the extravagant gestures and ecstatic expressions ; the sumptuousness of gilt and marble, vestments and music—and *light*, which is poured out or withheld, pin-pointed or flooded, tinted with coloured panes, or brought from behind the spectator, but always controlled, directed, stage-managed. Whatever artificiality and worldliness may be urged against the Baroque, it was, until modern times, the last great unifying cultural movement to be architecturally effective. What followed was bound to be anticlimax : the pale coldness of neo-classicism, and the long dismal trough of 19th-century eclecticism, when a church in the Byzantine manner would have more or less Byzantine lighting, a Romanesque imitation what openings went with that style, and a mock-Gothic church anaemic lancet windows with execrable glass. To-day, for the first time since the early 19th century, we rejoice once more in a vigorous and unified style—the architectural development known as the " modern movement." However, in spite of isolated experiments, the reintegration of sculpture and painting with architecture is still far from being a reality. In an age where the successful transition from landscape to portrait by Graham Sutherland or the achievement of a recognisable human face by Henry Moore are greeted with breathless amazement, we are not likely soon to recapture the serene inevitability of Gothic sculpture or the easy versatility of a Raphael. A modern work of art placed in a church is likely, therefore, to retain an arbitrary or fragmentary air, with the result that a greater emphasis is placed on the judicious use of light as the main carrier of emotion. Moreover, this century's great advances in building construction enable us to emulate and surpass the finest daylighting effects of the past : to achieve an even greater transparency and lightness than in Ste Chapelle, as in the church at Essen designed by Otto Bartning, or to concentrate the light to fall on the altar from above, without recourse to ponderous piers of obscuring masonry, as in the All Saints' Catholic church at Frankfurt-Main. Then, since thrust no longer has to answer thrust as in the tyranny of stone construction, lighting considerations can modify freely the shape of the plan, for instance to enable light to flood the apsidal wall from a mysterious hidden source at the side, as in the great church at Columbus, Ohio, by Saarinen, or the crematorium chapel at Abo in Finland. The tremendous advance in artificial lighting heralds a revolution in the lighting of churches of which the full possibilities are hardly yet apparent. We are confronted by a thorny question of tact : spotlight and fluorescent tube, high-powered lamp and coloured light have already picked up distracting associations with cinema and theatre, snack-bar and petrol station. But, after all, the window of the Gothic castle differed from that of the Gothic cathedral only in size and elaboration, not in style ; and for the chapel of the Illinois Institute of Technology Miës van der Rohe has used the same standard elements of glass, brick, steel and fluorescent light he had already employed, on the same site, for workshop and boiler-house. Yet the chapel is unmistakable : here, clearly, is a place of spiritual dedication—simple, harmonious and serene. With such an example before us we need not lose heart.



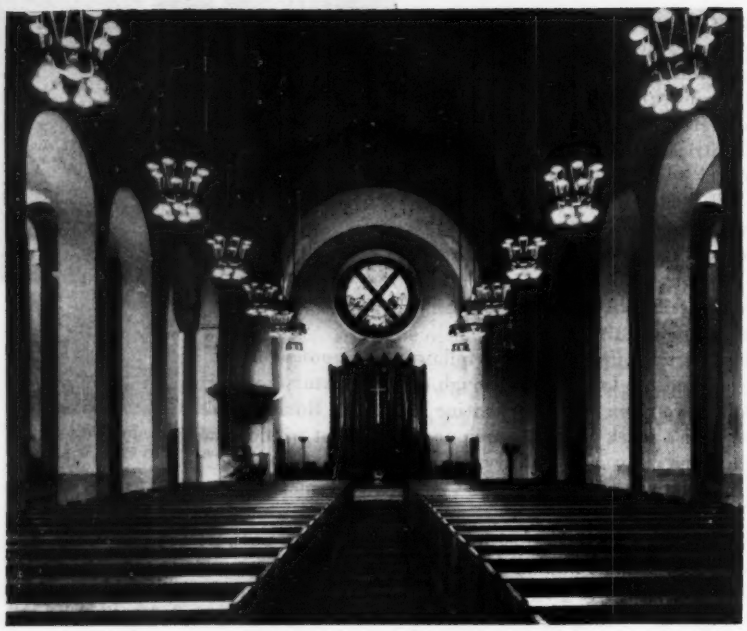
". . . an even greater transparency and lightness."



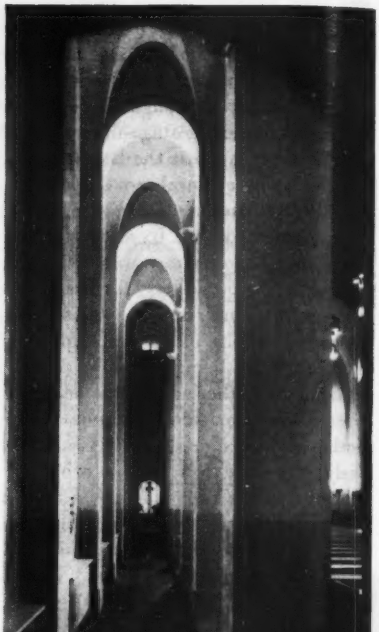
". . . a place of spiritual dedication—simple, harmonious and serene."

The eight illustrations accompanying this essay are reproduced by kind permission of the following :—In the sequence in which they appear, (1) Stonehenge (the Ministry of Works—Crown Copyright) : (2) the Temple of Khons, Karnak, from *A History of Architecture on the Comparative Method*, by Sir Banister Fletcher (the Athlone Press, University of London) ; (3) the Acropolis, Athens (Greek Information Office) ; (4) east window of Ste Chapelle, Paris (French Embassy, London); (5) dome of S. Lorenzo, Turin (Manford Belmore) ; (6) All Saints' Catholic Church, Frankfurt-Main (Royal Institute of British Architects) ; (7) church at Essen *(Der Baumeister Otto Bartning)* ; (8) chapel at the Illinois Institute of Technology *(L'Architecture d'Aujourdhui)*.

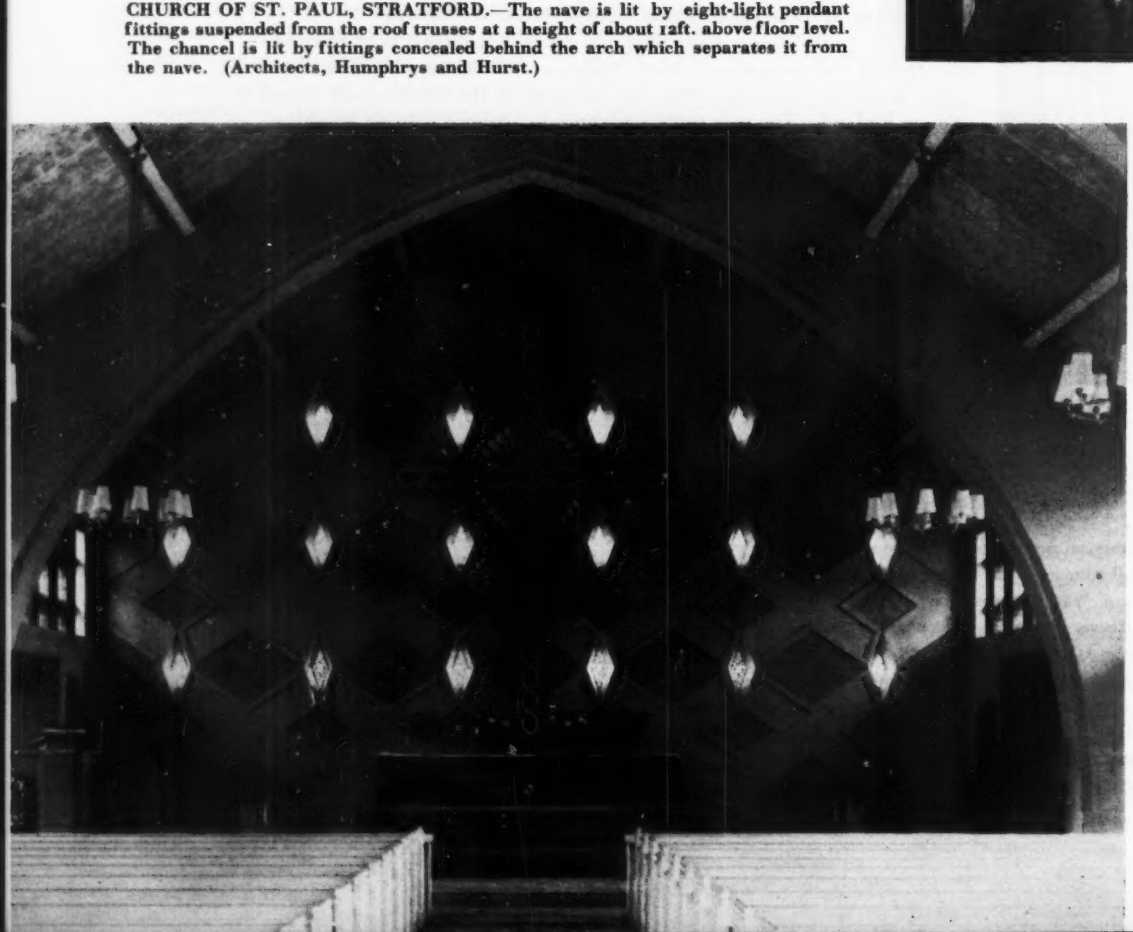
RECENT BRITISH EXAMPLES OF CHURCH LIGHTING



ST. COLUMBA'S (Church of Scotland), LONDON, S.W.1.—The photograph above shows the general lighting of the nave—mainly from 14-lamp pendant fittings. The chancel is lit by two floor standards giving upward light only. The photograph on the right, looking down the south aisle, shows the lighting of the vaulting by upward reflecting cups fixed near the tops of the piers. (Architect, Sir Edward Maufe, R.A.)



CHURCH OF ST. PAUL, STRATFORD.—The nave is lit by eight-light pendant fittings suspended from the roof trusses at a height of about 12ft. above floor level. The chancel is lit by fittings concealed behind the arch which separates it from the nave. (Architects, Humphrys and Hurst.)



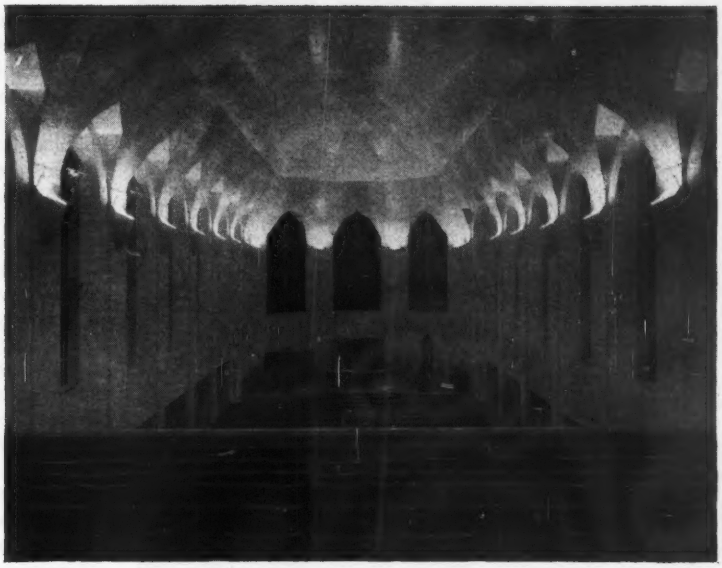


Fig. 1, Presbyterian church lit indirectly from urns.

THE LIGHTING ENGINEER'S APPROACH TO

The Lighting of New Churches

By M. W. Peirce, F.I.E.S., and J. M. Waldram, B.Sc., F.I.E.S.

THE eight photographs of modern churches which illustrate this article, selected architecturally at random, show more differences in design, construction, materials and even symbolism than could be seen in churches of the traditional style over a period of 400 years. Therein lies the distinction between "new" and "old" churches. Traditional churches were originally Catholic; they became standardised in their principal features as they did in their forms of worship; moreover, they were mostly built of stone and wood, and their design evolved from the need to make such structures stand up—only the successes remain. When old churches were built daylight was unimportant, and artificial light was not thought of.

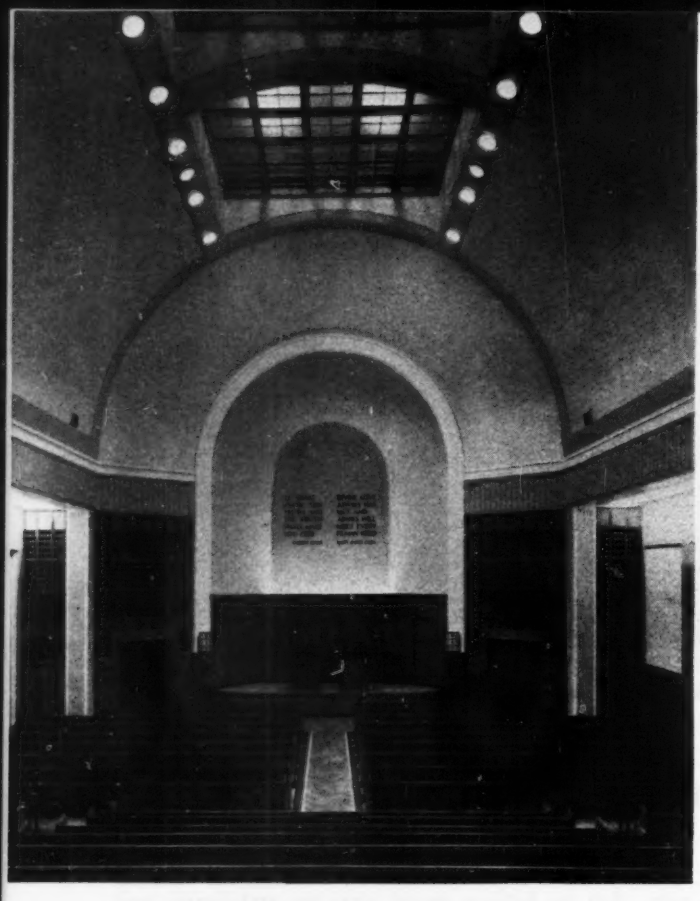
To-day nothing is standard. Churches are built for different denominations, with different traditions and forms of worship; the architect can choose from many building techniques: brick, steel frame, reinforced concrete, wood, prefabricated constructions and others. The cross on one church was recently placed in position by a helicopter. The architect has great freedom in design; he can conceive the building as a whole, and can express his symbolism in his own way. He uses light deliberately, particularly daylight, whether in the mysterious dimness of Liverpool or in the subtle lightness and delicacy of Coventry. He makes provision for artificial light and often designs the fittings, though sometimes with no clear idea of their effect on his architecture; and it is at this point that the lighting engineer can contribute his experience and knowledge.

The lighting of a church is closely bound up with its architecture. The aesthetic effect is paramount, for the amount of light provided need not be great—the technical requirements of the congregation and clergy are easily met. As the main problem is that of appearance, its solution must be found in close collaboration between the lighting engineer and the architect.

It is impossible to lay down many rules for modern churches, since they are so diverse in style, layout, symbolism and materials; there is, however, one cardinal rule—that the lighting should serve the architecture and the symbolism: it must never conflict with it. The questions to be asked in designing a lighting scheme for a church are not, primarily, "Couldn't we put a fitting up there?" but:—What should the congregation see as the principal object of regard? Where should the emphasis be? What regions should be suppressed? What kind of atmosphere is desired? How should the vistas appear? What should be the principal direction of light? Are colour effects desirable, and what should they be? And so on.

A study of modern churches shows that, though in some the lighting and the architecture are in harmony and create a coherent effect, in others the architects seem to have lost their way, and to have experimented with tricks of architecture and lighting without any clear purpose. Sometimes the lighting conflicts with the architecture and spoils its effect. The new approach to designing lighting schemes known as Designed Appearance Lighting here comes into its own. In this method, the architect lays down the pattern of light and shade and the modelling that he desires, and the illuminating engineer designs the installation to achieve it, using the new techniques that make this possible. In a proposed building, where experiment is impossible, this approach has obvious advantages.

Some of these points are demonstrated by the accompanying photographs. It must be made clear, however, that the comments on them are the result of inspection of the photographs only, and without knowledge of the local circumstances; they are themselves open to criticism and are offered in that spirit. Fig. 1 shows a Presbyterian church with a light interior and a mansard vault roof. Indirect lighting has been used, from urns which are part of the structure. The result is that the vault is rather formless and much too bright, and that the



Above, Fig. 2, Christian Science church, with barrel-vaulted lantern roof, lit by down-lights around the laylight. Below, Fig. 3, Catholic church indirectly lit from the cornice.

interior is bisected by the bright splash of light above the urns in a way that conflicts with the vertical lines of the church. The interior, the pulpit and the furniture in the chancel appear flat and formless and without emphasis. A feature of this church is the east window, glazed with wide white bars which themselves form the design, which is revealed by night as well as by day in an unusual and attractive way.

Compare this first example with Fig. 2—a Christian Science church with a fine barrel-vaulted lantern roof, and a string course below it. The series of round arches at the chancel has clearly been carefully designed and decorated to lead the eye to the texts at the centre. The temptation has been resisted to use cornice lighting to light the barrel vault. This would have over-emphasised the ceiling and upset the balance of the series of concentric arches. Moreover, lighting from the cornice would have bisected the interior, leaving the string course and the lower part of the building dark and flat. The lighting by down-lights around the laylight keeps the ceiling subdued in brightness. However, it might be thought that the use of the dark panelling behind the two lecterns and the cornice lighting at the head of the panelling is less successful, forming a bright patch just above the lecterns and below the texts, taking the emphasis from them both. The rostrum and lecterns are symmetrically lit by floodlights, almost from above, which results in flat and featureless lighting of the panelling of these features. Lighting from one side would have been better.

In spite of the foregoing remarks, it is possible to use indirect lighting from a small cornice effectively, provided it is carefully designed. Fig. 3 shows a Catholic church lighted in this way. It is a similar church to that seen in Fig. 2—concentric round arches lead the eye to the altar, to which emphasis is given by special lighting, but the roof is flat. The ceiling of the nave and the upper part of the wall above the cornice is bright, but both surfaces are broken, the ceiling by the bold dark pattern of squares and the upper part of the wall by the large dark arches which reduces their emphasis. (Compare with Fig 8.) Since only the nave is lighted indirectly, and the altar and sanctuary are emphasised, the dull effect seen in Fig. 1 is avoided. The break which occurs at the cornice is deliberate and is emphasised by the decoration. However, the altar and sanctuary are again lit by spotlights symmetrically arranged, with consequent loss of form.

The Presbyterian church seen in Fig. 4 is lighted by down-lights from the ceiling of wood panelling, which is deliberately kept dark. The simple and rather severe interior is clear of fittings. Had the pulpit been occupied when the photograph was taken, it would have been seen that the occupant is well modelled. There is, perhaps, insufficient contrast at the chancel arch, which can be compared with that in Fig. 3, and the form of the apse is lost as a result of lighting which is too symmetrical. The window is probably an important feature by day, and its rich colouring is just what is needed to set off the severe lines of the interior. By night this effect is lost, and it is clear that more attention should be paid to the lighting of stained glass at night.

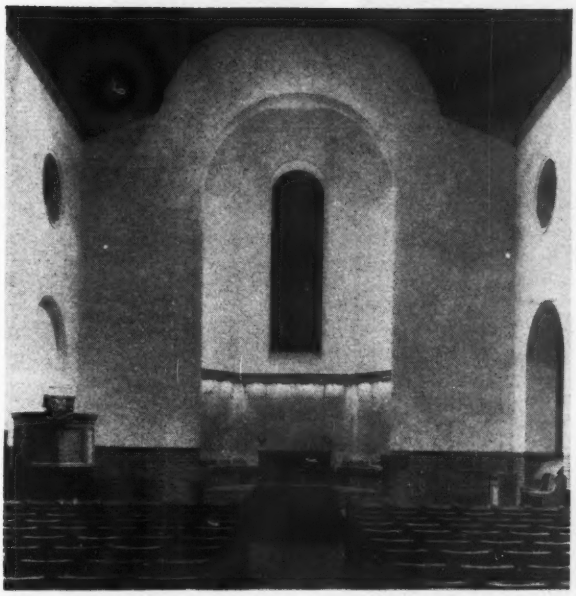
The Baptist church shown in Fig. 5 seems to be a temporary building, or one built with great economy. The roof structure is apparently of precast concrete portals with panels of building board between. The lighting is by fluorescent lamps behind the trusses. The vertical faces of the trusses are at right angles to the incident light and

therefore appear very bright, over-emphasising the roof and drawing attention to a feature which is not perhaps the most beautiful in the church. If they could have been painted a darker shade this effect would have been reduced, but the darker colour would have had to be applied also to the rest of the roof, to avoid "picking out" the trusses. The lighting is not as flat as in Fig. 1, because it has a large direct component.

The small church seen in Fig. 6 is built of brick, even down to its furniture. This gives it a heavy appearance, for brick courses tend to camouflage form. The lighting is indirect, from false beams set on the ties of the trusses, and is reflected from white panels which conceal the trusses. The result is that the panels are extremely bright and the underside of the false beams very dark, making them look oppressive and glaring at the same time. The apse end is well emphasised by special lighting, but the preacher in the brick pulpit would be seen silhouetted against it.

The two Catholic churches shown in Figs. 7 and 8 are good examples of coherent design. The first is a good example also of the effective use of colour, used to pick out the various vistas in a way which the photograph cannot portray, and of the use of lighting fittings designed to match the interior. Fig. 8 shows a fine example of architecture and lighting working hand in hand: the lighted domes give an open-air effect and relieve the weight of the stonework without attracting the attention unduly. The altar is well emphasised and forms a natural object of regard. The vistas through the arcade to the side chapels and the contrast of the lighted domes and the dark arches between have been carefully designed. Colour has been used, the domes being lit by cold-cathode intermediate-white lamps, the sanctuary by tungsten lamps, and the ambulatory behind the altar with mellow fluorescent lamps. "Natural" lamps are used for the side chapels, and a shrine behind the altar is lit by a flame-sprayed tungsten lamp.

Nearly all the churches described above have been lit symmetrically and without any attempt at modelling. Recent work has demonstrated the importance of pro-



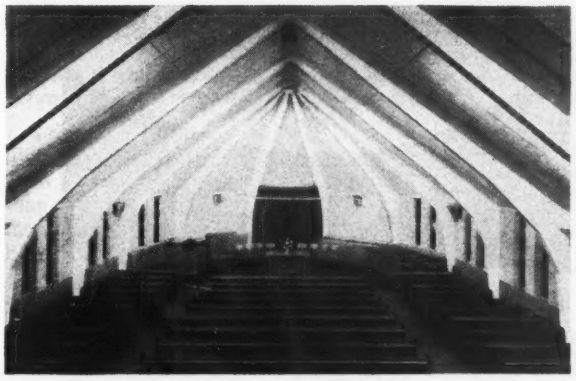


Fig. 4, Presbyterian church lit by down-lights. Below, Fig. 5, Baptist church lit by fluorescent lamps concealed behind the precast concrete beams.

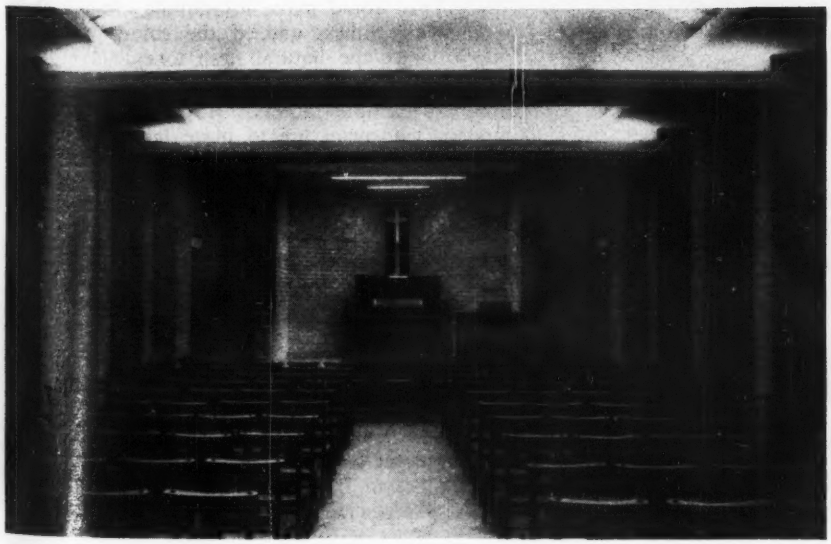
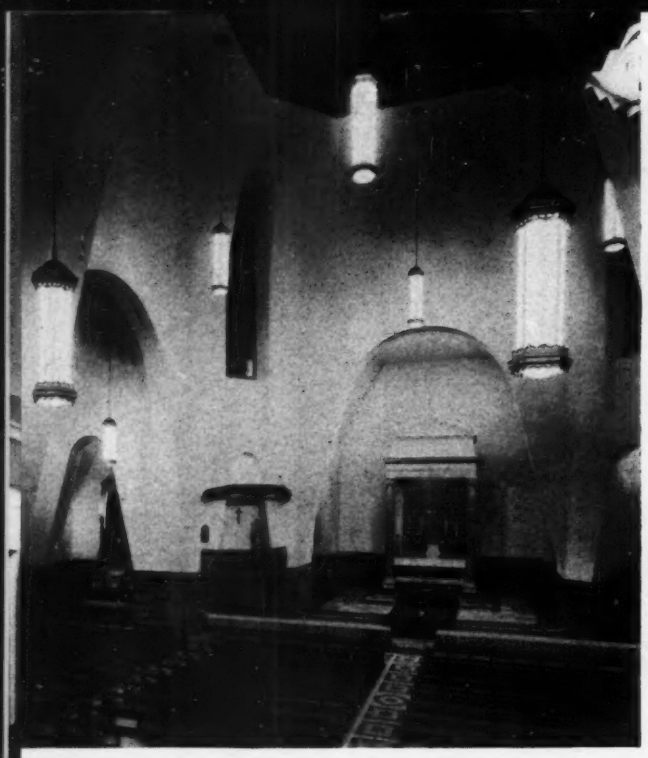


Fig. 6, Baptist church lit indirectly by fittings concealed by false beams.



Top, Fig. 7, Catholic church lit by specially designed pendant fittings. Above, Fig. 8, Catholic church lit indirectly from domes.

viding a coherent flow of light with some modelling from the side, to reveal the shapes of architectural features such as mouldings and to show up faces pleasantly. It has been shown also that accent lighting from two sides gives almost no modelling. This can be seen from the lecterns in Fig. 2 and the altar in Fig. 8. The principle is understood by architects, who often provide a small window on the south side of the altar to provide accent lighting and strong modelling. Important features of the church, such as the altar, are the principal objects of regard, but they are seen by most of the congregation from a distance at which details are lost if they are not well modelled.

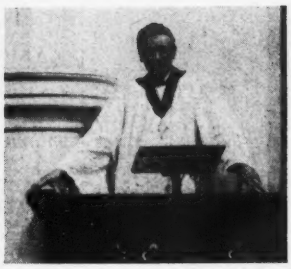
Fig. 9 shows a beautiful tapestry reredos and fine altar furniture lit from both sides by symmetrically placed spotlights. There is almost no modelling and the appearance is dull. Fig. 10 shows the same altar with the spotlights on one side extinguished ; the result is much better. Some fabrics with a woven pattern not differentiated by colour appear completely featureless if symmetrically lighted; they depend on directional light to reveal their pattern and texture.

The occupant of the pulpit, too, is often badly revealed by the lighting ; his face is made to appear flat or it is left darker than its surroundings. Sometimes there is strong light from a local source immediately above, which is unkind to the bald and gives grotesque facial shadows. Worst of all is light from below, e.g., from a desk light, which gives the preacher a satanic appearance and sometimes casts a mocking shadow of his gestures on the wall behind him.

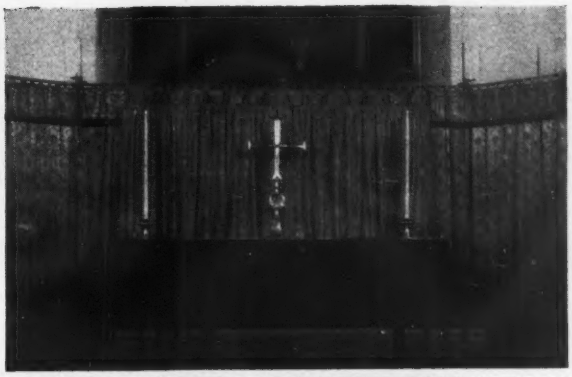
Fig. 11 shows the preacher in the pulpit of a church well lit by fluorescent lamps, but his face appears flat and dark, so that his expression is hard to see. Fig. 12 shows the effect of adding an accent light placed high in the roof on the far side of the church, at about 50 deg. elevation and 50 deg. in azimuth from the line of sight. Its effect is not at all dramatic, but the preacher becomes easy to see and his face is naturally revealed. There is no noticeable glare to the pulpit at these angles, but there is still a defect, for the surplice almost matches the wall, so that from a distance the preacher seems almost disembodied. A better result could be obtained by providing a coloured curtain as a background to the preacher. This would make his outline clear, increase the apparent brightness and, if the colour were blue, it would enhance the natural flesh tones.

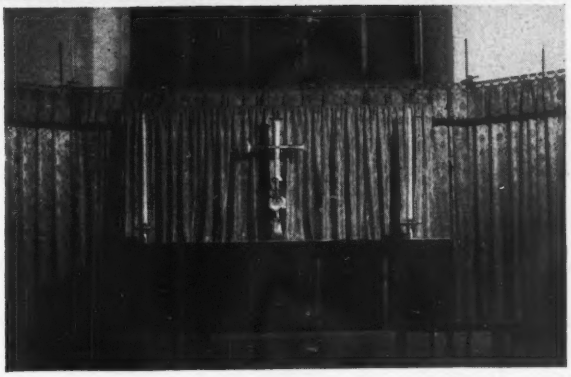
Church lighting presents some interesting maintenance problems; for example—access. Most churches are lofty, and modern tendencies are to place lamps high. The authors have seen one modern church where the lighting was partly out of action and was replaced by bare lamps hanging from flex because the original lamps had failed and could not be reached for replacement. In a cathedral there are usually access passages and crawl-holes by which equipment can be reached, but a church has no such facilities, and special equipment is usually needed to reach the lamps.

Fortunately, the hours for which artificial lighting is needed in a church are small (at least for the nave lighting which is generally the least accessible), so that even tungsten filament lamps have a long life. Hot-cathode lamps, of course, have a longer life, and cold-cathode lamps can be regarded almost as part of the structure. Nevertheless, the equipment will need to be



Left, Fig. 11, Preacher in pulpit of church with general lighting alone. Right, Fig. 12, same preacher in same pulpit with accent light from other side of church.





Top, Fig. 9, Altar and reredos lit from both sides. Above, Fig. 10, the same altar and reredos lit from one side only.

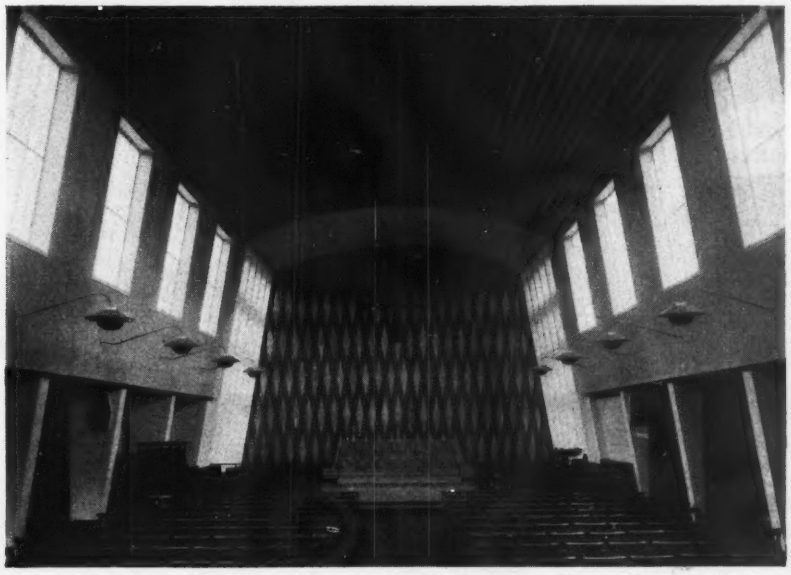
cleaned, and maintenance done by contract is probably the most satisfactory method.

Maintenance of a church lighting installation is particularly important if the equipment is nicely adjusted and, even if the responsibility for cleaning and lamp replacement is in expert hands, it is possible that, over a period of years, directional reflectors will become seriously maladjusted and pearl lamps will be replaced by clear lamps or *vice versa.* Lighting equipment for churches should be designed so that its adjustment is not critical, and the desired lighting effects should be obtained in the simplest possible way, in order to guard against maintenance difficulties. It is desirable also that, even for a small installation, a detailed maintenance chart should be provided so that the alignment and operation of the lighting equipment can be checked.

Wiring runs in churches are often very long, and the wiring must be as permanent as possible. This means that expensive materials, such as mineral-insulated cable, must be used, and the cost of the wiring is often greater than the cost of the lighting equipment. It is important, therefore, that the electrical installation, as well as the lighting system, should be designed with the greatest care.

BRITISH EXAMPLES OF CHURCH LIGHTING

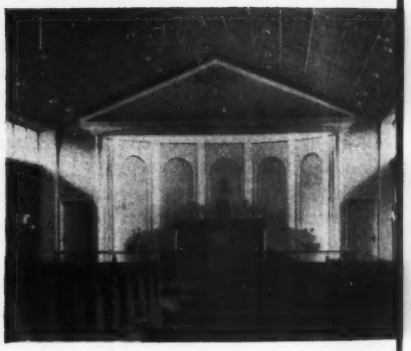
(continued)



St. Nicholas Church, Coventry.—The nave is lit by special fittings designed by the architects in conjunction with E. Heffer and Co., Ltd. The copper conduit is led out from the wall, but the fitting is suspended "semi-invisibly" by piano wire from the ceiling. The sanctuary is lit by 10 fittings recessed into the ceiling. (Architects: Lavender, Twentyman and Percy.)

RECENT BRITISH EXAMPLES OF CHURCH LIGHTING
(continued)

ALL SAINTS', DARLASTON.—Designed by Lavender, Twentyman and Percy, the nave of this church is lit by floodlights in the aisle ceilings. The fittings are in boxes, fixed flush to the ceiling, with hinged bottoms of ribbed glass. The sanctuary is lit by other floodlights concealed between the fins on the north and south walls.



CHURCH AT SIDLEY, SUSSEX.—The main body of this church (below) is 64ft. long, 31ft. wide, and 19ft. high to the internal ridge; it is lit by four rows of ceiling spotlight fittings. The central two rows house 150-watt pearl lamps; the outer two rows, 100-watt lamps. In addition, there are 20-wall-bracket fittings, giving upward light only from 150-watt Silverlight lamps. The apse (right) is lit by four 40-watt daylight fluorescent lamps concealed behind the ornamental pediment. A 75-watt spotlight lights the monstrance when it is on its throne at the rear of the apse. (Architect, Alex F. Watson, A.R.I.B.A.)

Interior of village church at Thayngen, Switzerland, designed by Joseph Schutz.

THE ARCHITECT'S APPROACH TO

The Lighting of New Churches

By Edward D. Mills, F.R.I.B.A.

LIGHTING, both natural and artificial, plays a large part in determining the "atmosphere" inside a building. In churches, the creation of an appropriate atmosphere is of the utmost importance: unsuitable lighting can easily produce a discordant note and it can destroy totally the effect of a well-designed interior. An ill-considered scheme or badly chosen fittings can have a disturbing effect on a church congregation.

Many architects and lighting engineers seem to believe that the interior of a church should be dark and gloomy and they refer to a "dim, religious light," but a church of contemporary design should be as well lit as any other modern building and its daylighting, in particular, should be one of the main factors in its conception.

The design and placing of the windows is closely related to the architect's approach to the design of the church as a whole, and few rules can be laid down regarding the relationship between the windows and the rest of the church. However, as in all buildings, the windows should be large enough to provide an adequate level of illumination and should be placed so as to minimise visual discomfort.

It is difficult to recommend a specific daylight factor, but a minimum of 1 per cent. for the main church interior has been suggested, with 1.5 per cent. in the sanctuary. Glare should be avoided, and direct sunlight, if admitted, should be carefully controlled. Sharp beams of sunlight can be used to "pick out" important features (although there is a danger of these beams of light becoming a distraction), and direct sunlight can help in giving depth to the modelling of the interior. But it should be remembered that the sun does not always shine, and it is advisable, therefore, to have alternative methods of achieving the same results.

Stained glass and coloured glass, used intelligently, can give colour and richness to a modern church interior, but the siting of these windows must be given very careful consideration.

Two valuable principles concerning the daylighting of churches are: First, that it is usually undesirable

Interior of model of new Coventry Cathedral (architect, Basil Spence). Lighting comes from tall, narrow windows at the sides.

for a large window to be immediately opposite the congregation, particularly if the window faces east and is glazed with clear glass. (Such a window, behind an altar or pulpit, can cause glare and obscure the outline of the altar or preacher.) Secondly, that a large window immediately opposite the priest or minister can be distracting, particularly if it faces south or is in such a position that the sunlight can shine directly on him.

The traditional shape of church windows—tall and thin—has been proved satisfactory during centuries of church-building, and there is no doubt that well-detailed windows of this shape give pleasant and diffused lighting and minimise glare. However, there is no reason why the use of this type of window should not be adapted to conform with contemporary ideas—the design by Basil Spence for the new Coventry Cathedral provides an excellent example of how tall, shielded windows can be incorporated in a contemporary church interior.

Artificial lighting is equally important: it must be of sufficient intensity over the seating area to enable people to read small print without eye-strain; it should be distributed evenly; and contrasts in the body of the church should not be too great. Dazzle must be prevented by obscuring the sources of light from the congregation's view.

These requirements suggest a simple form of indirect lighting, which has been proved satisfactory in many churches, but this often fails to produce sufficient contrast, and the lighting tends to lose its efficiency as the walls and ceiling of the church, which act as reflecting surfaces, become dirty. Indirect lighting, when used, should be supplemented by direct lighting, but, on the other hand, if direct lighting alone is used, some of it should be directed toward the ceiling to brighten the upper part of the church and to give a sense of "lightness" to its interior.

The following principles should be borne in mind in planning church-lighting schemes:—

1. The pulpit, lectern, choir and clergy stalls may be lit locally, while the rest of the church is best lit by a combination of direct and indirect lighting.

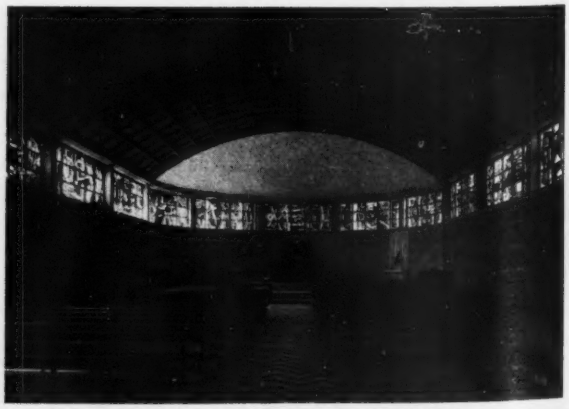
2. The focal point of a church is the altar or communion table, or its equivalent according to the denomination concerned, and the part of the church in which this stands should be lit with particular care: indirect lighting is most suitable, with some special form of illumination for the altar or communion table itself. Care should be taken, however, to avoid a theatrical effect—over-dramatisation is, in general, out of keeping with the character of a church interior.

3. In most churches, the pulpit or lectern is badly lit: the traditional method is a strip-light over the reading desk, which is cumbersome and tends to create shadows in the wrong places. Proper pulpit lighting should illuminate clearly the preacher's face, making it easy for the congregation to follow the sermon, and should provide adequate, glare-free lighting of the desk. The use of an overhead spotlight is recommended, provided its design and placing is carefully considered. The source of the light should be concealed and, again, theatrical effects must be avoided.

4. To prevent glare and dazzle in the body of the church, fittings for the general lighting should be designed to prevent a direct view of the light source. For economy (both in installation and maintenance), the number of fittings should be minimised.

5. It is desirable that the main lighting should be arranged so that, by means of a simple switch, it can be dimmed at any appropriate moment during a service. In addition to saving electricity, this can help in creating the right atmosphere during particular parts of the service. The switch must, of course, be placed in a position where it can be operated quietly, so as not to distract the congregation.

6. Maintenance of church-lighting installations is an acute problem, particularly when large fittings are fixed to or suspended from a high roof. It is essential that there should be easy access to the fittings and, if no form of access except ladders, or similar devices,

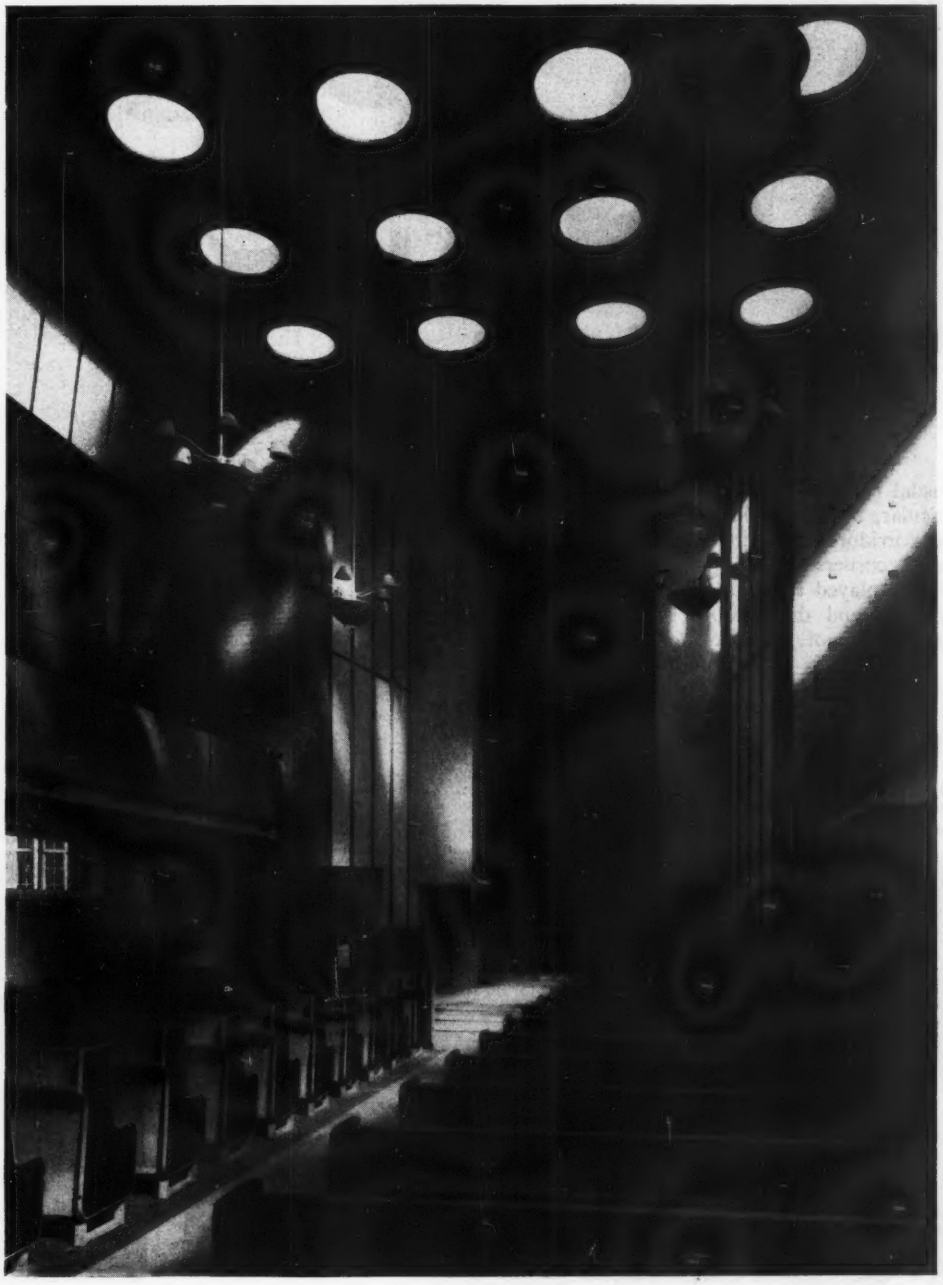


Interior of the Church of the Sacred Heart, at Audincourt, France, designed by Maurice Novarina.

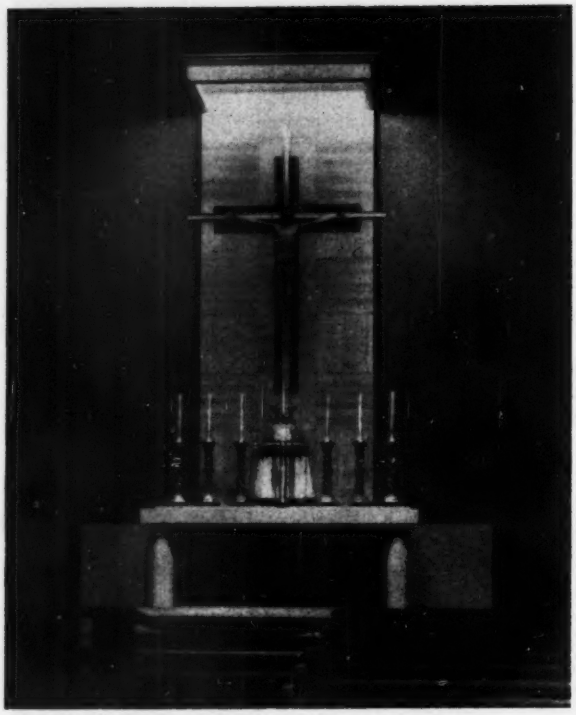
can be provided, fixed high-level fittings should not be used. Pendant fittings must be arranged so that they can be raised and lowered for regular cleaning and for lamp replacement.

7. When large-wattage lamps are used in metal reflectors radiant heat can be produced to an extent liable to cause inconvenience or even danger. This should be taken into account in designing fittings of this type and adequate ventilation of the fitting should be provided. Design for indirect lighting must allow for the space required by the reflectors—if these are inadequate in size less than the full value will be gained from the lamps used. The design of lighting fittings which are exposed to view is doubly important: in addition to performing their function satisfactorily, they should be attractive in appearance without being obtrusive. They should not be of such design as to form focal points which will distract or irritate the congregation; nor should they vie for attention with other fittings that play a more important role in the activities of the church.

The modern church is often part of a building or group of buildings where many activities take place and where a wide variety of interests are catered for. Attention must be paid, therefore, to the lighting of those parts of the building other than the church itself. The



Interior of Trinity Church, Poplar, London, designed by Handisyde and Stark.



The creation of dramatic effect by the suitable lighting of a high altar of simple modern design.

usual rules of good lighting should be applied : in particular, adequate illumination levels should be provided in corridors and staircases to prevent accidents and avoid dark corners. In rooms or halls where ball-games are to be played the fittings should be of a type not easily broken and they should be placed in positions where they will not interfere with the game.

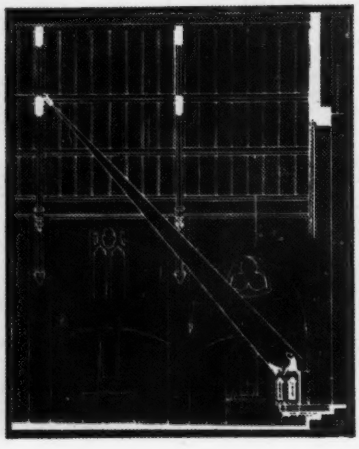
If there is a stage in the church hall, it should be supplied with electricity by a separate circuit designed to take the additional load of stage lighting for dramatic performances. There is no need for elaborate fixed stage-lighting, but the installation should be such as to enable members of the dramatic group to develop their own stage-lighting schemes, for much of the enjoyment of amateur dramatics lies in the opportunities it gives for arranging the lighting, building the scenery and making the costumes, so that the entire final production is the result of the teamwork of the drama group.

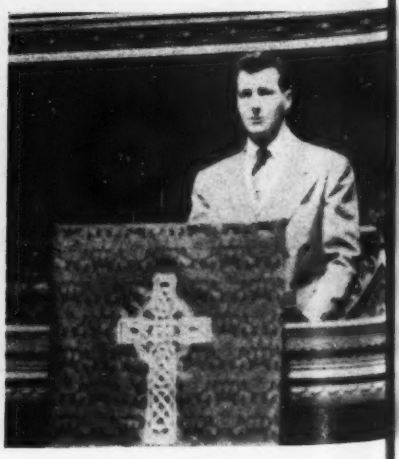
In all churches there should be notice boards for the announcement of meetings and other information. These should be made centres of interest by means of suitable lighting, preferably strip-lights. Control of the lights should be from locked switches, to prevent unauthorised interference and the lights for notice boards outside the church should be controlled from within the building.

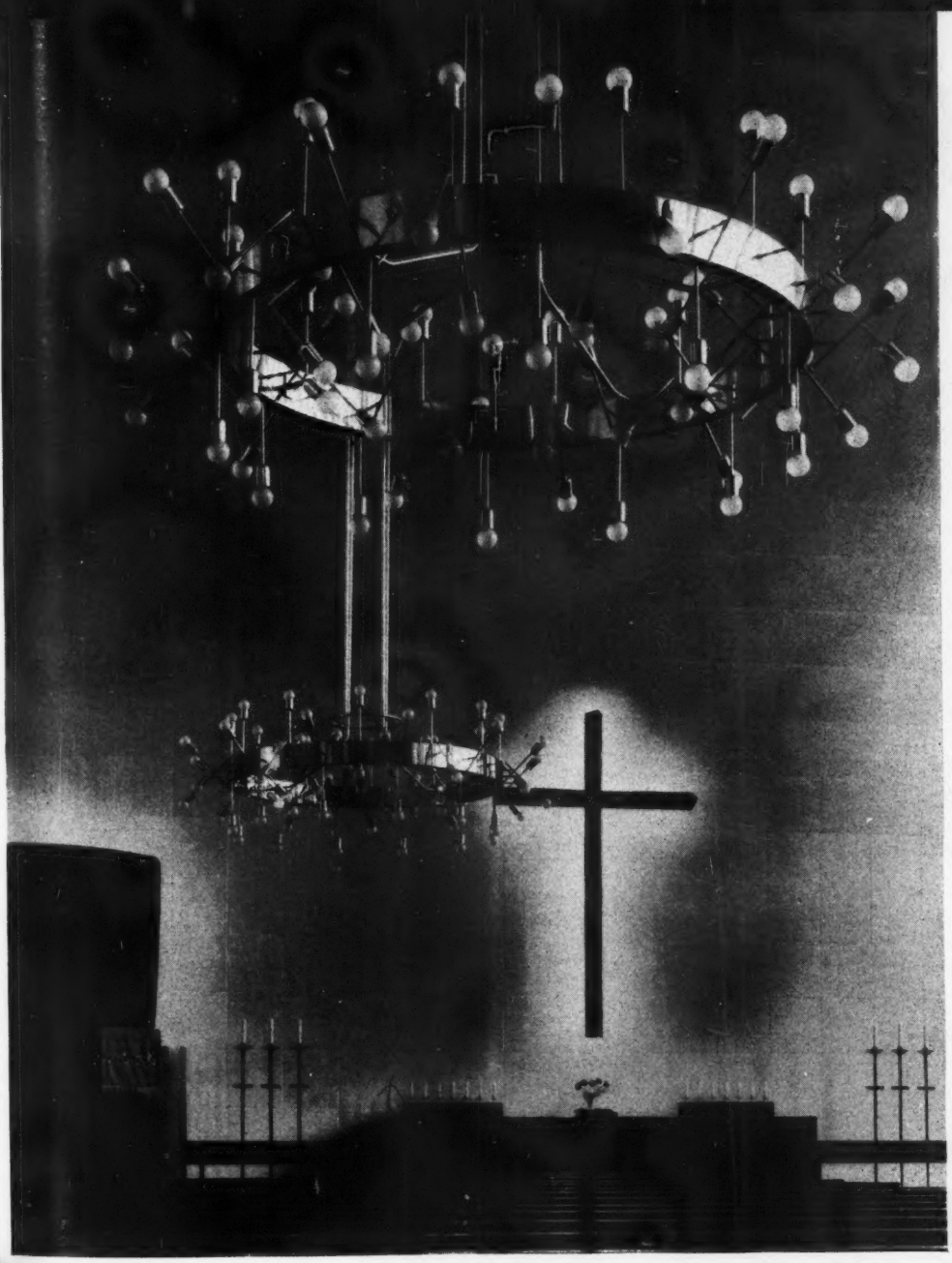
The external lighting of churches is seldom given serious thought. Yet, while the cost of providing full floodlighting may be considered too great, except for churches of national importance, the use of localised floodlighting can be very effective in focusing attention on the building, whether used permanently or only on special occasions. Local floodlighting or spot-lighting can be directed towards a point of special interest, such as a sculptured group or a cross, tower or steeple. It draws attention to the building at which it is directed and it serves also to add interest to the street or group of buildings in which the church is situated.

The electrical installation of a church is just as important as the lighting : more damage has been done both to ancient and to modern church buildings through the activities of amateur electricians than by any other means, and faults in badly wired electrical circuits are one of the most common causes of fire in buildings. It is essential, therefore, that all electrical installations in churches should be carried out by properly qualified electrical contractors, under the supervision of the church architect, and that an adequate specification should be agreed. Excessive economies in the initial installation can be costly in the long run, because more frequent maintenance and repairs will be needed. It is a false economy to minimise the number of lighting points and socket outlets, as this may lead to inefficient and dangerous improvisations being made after the building is completed.

Lighting the pulpit: Left, the effect of using a local light source; centre, the method of using two spotlights hidden behind the trusses; right, the effect of using an overhead light source placed at the most favourable angle.





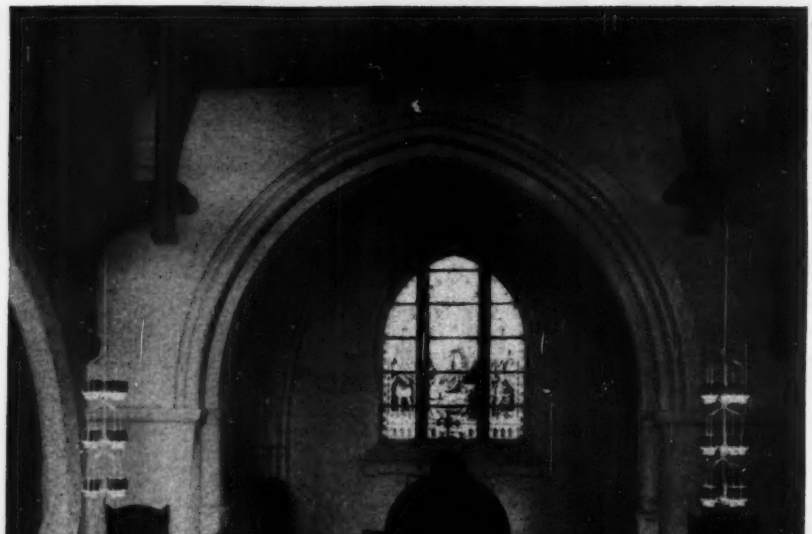


CHURCH LIGHTING ABROAD: FINLAND

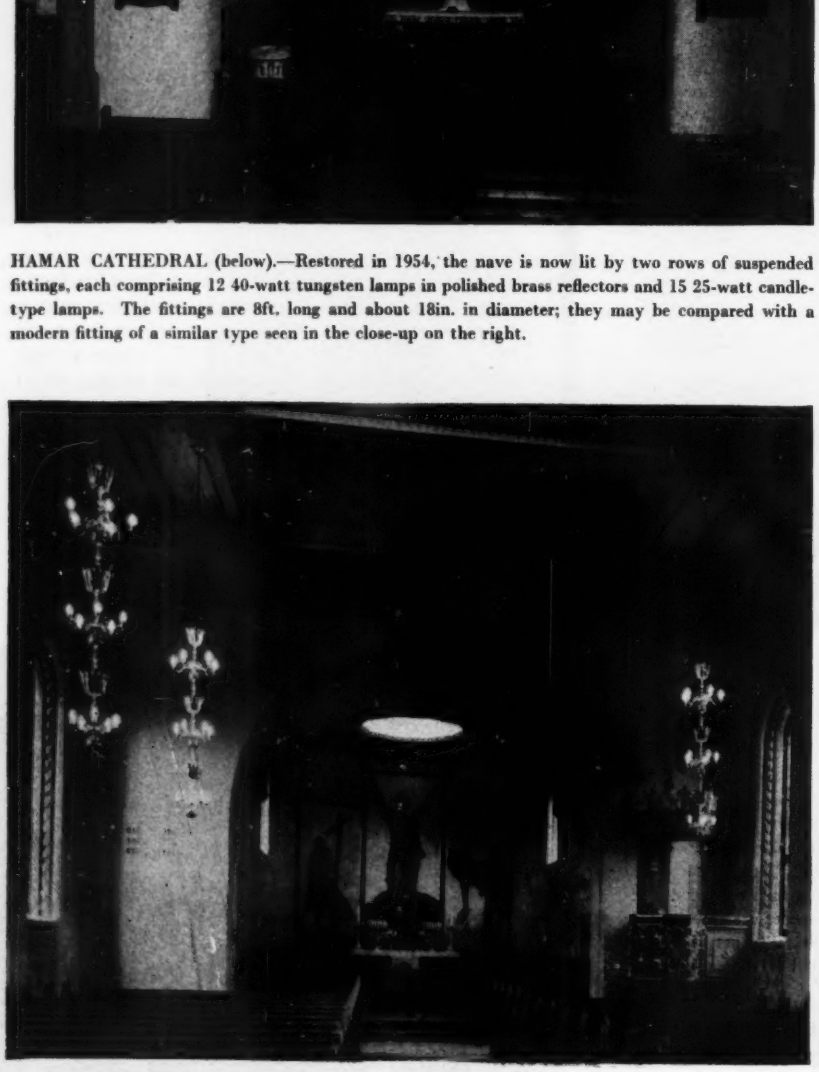
MEILAHTI CHURCH (above).—Close-up of two of the principal lighting fittings. Resembling in shape the "crown of thorns," they each comprise 72, 25-watt tungsten lamps, and give an illumination level of 2.5–3 lm/ft.². Glare is minimised by the light colour of the ceiling and walls. The altar is lit by eight 150-watt concealed spotlights; harsh shadows which these might have caused are prevented by the light from the main fittings. The cross is silhouetted against lighting from tungsten lamps concealed behind its V-section arms.

MUNKKINIEMI CHURCH, HELSINKI (right).—The nave is lit by 75-watt crown-lights recessed into the flat ceiling, the dais by concealed spotlights.

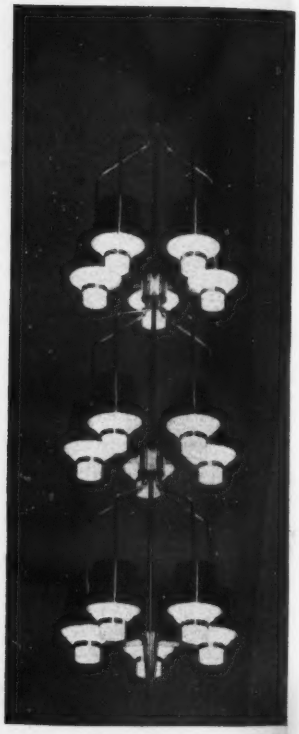
CHURCH LIGHTING ABROAD: NORWAY



HAMAR CATHEDRAL (below).—Restored in 1954, the nave is now lit by two rows of suspended fittings, each comprising 12 40-watt tungsten lamps in polished brass reflectors and 15 25-watt candle-type lamps. The fittings are 8ft. long and about 18in. in diameter; they may be compared with a modern fitting of a similar type seen in the close-up on the right.



FAGERBORG CHURCH (left).—Built at the turn of the century, the present lighting scheme was installed in 1953. The nave is lit by two rows of suspended fittings, each housing 15 75-watt tungsten lamps. The fittings, see close-up below, are of dull brass and Opaline glass.



Below, one of the suspended fittings now used to light the nave of the PETRUS CHURCH (1880). It houses 11 40-watt tungsten lamps, is 2ft. in diameter, and is made of dull brass.

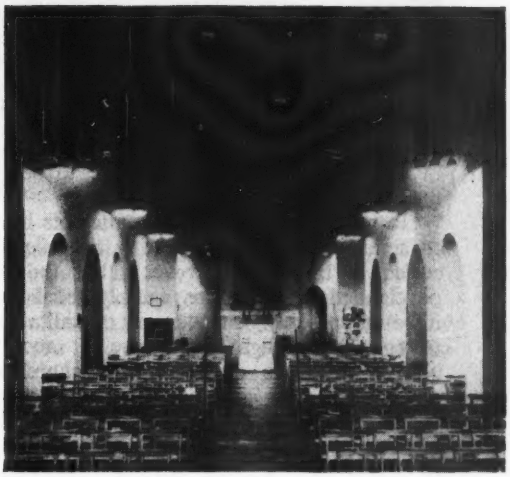
The Re-lighting of Old Churches

By D. W. Tyrrell, A.M.I.E.E., F.I.E.S.

CONSIDERED in the light of the materials and tools available when they were built, the design and craftsmanship of Britain's Saxon, Norman and later churches cannot fail to be a source of wonderment. All too often, however, one can find examples of minor acts of vandalism perpetrated as a result of what were, at the time, considered "improvements." It is impossible for those entrusted with alterations or additions to old churches to give too much thought to the problem of avoiding anything that might, in any way, mar the beauty of the building or detract from the sacred atmosphere within it.

Much attention was paid by church builders of old to the natural lighting of their church interiors. Windows in the earlier churches were usually in the form of narrow slits, partly because the buildings served on occasion as places of refuge and partly because of the difficulty encountered in supporting the walling above the apertures. These small windows produced a dim atmosphere conducive to reverence and worship, and the fact that the illumination level was low was of little importance, since the visual demands of priests and worshippers were few.

Later, windows became larger, until they occupied the entire space between the piers of the north and south walls, and clerestory windows were added when the height or width of the nave was too great for lighting from the side aisles only to be adequate. These large windows along the side walls gave a flood of light, principally from south to north across the length of the church. The use of stained glass developed as a means of diffusing this flood of direct light from the sky and of giving a



Below, Figs 1 and 2, two night views of a church, showing (left) lighting by cluster fittings equipped with direct-lighting reflectors and (right) lighting by similar fittings equipped with semi-direct translucent reflectors. The photo above (Fig. 3) is a night view of the same church lit by the direct-lighting fittings, but seen from the opposite end of the nave.

Fig. 4, night view of church interior lit by semi-direct pendant fittings, suspended in the aisles, midway between the arches.

quality to the light that has come to be considered by many as essential to church lighting.

In re-lighting old churches, attempts have been made to simulate the natural lighting by reflector units concealed in the window reveals, but the results cannot be claimed to have been entirely satisfactory. In fact, it would probably be true to say that all attempts, to date, to reproduce daylight effects have left much to be desired. Nevertheless, the daylighting of churches should be studied, in so far as it gives an indication of the way in which the architect intended the form of the interior to be revealed.

Illumination Levels

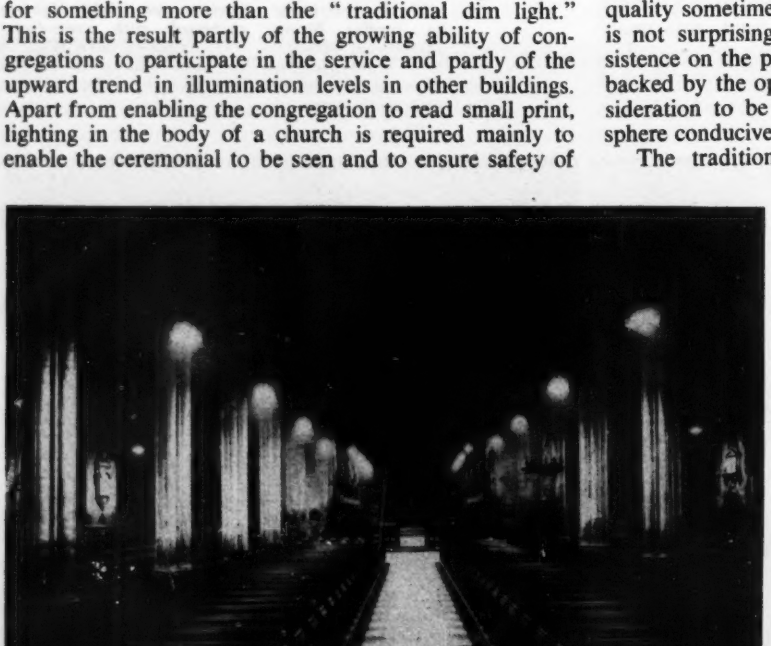
In recent times there has been an increasing demand for something more than the "traditional dim light." This is the result partly of the growing ability of congregations to participate in the service and partly of the upward trend in illumination levels in other buildings. Apart from enabling the congregation to read small print, lighting in the body of a church is required mainly to enable the ceremonial to be seen and to ensure safety of movement, but it should be appreciated that adequate levels of illumination do not necessarily produce good seeing conditions. As important as the illumination level are the location of the lighting fittings (so that members of the congregation can, when standing, see their hymn-books without the print being obscured by the shadows of their neighbours' heads), the "quality" of the lighting, and the luminance of the light sources.

The I.E.S. Code of Lighting in Buildings recommends at present an illumination level in churches of 5-7 lm/ft² at 3 ft. above floor level. In Anglican and Catholic churches, 5 lm/ft² is generally considered adequate, though, as some diversity in illumination is inevitable, this usually means having about 6 lm/ft² immediately under the fittings, falling to 4 lm/ft² along the side walls and as little as 3.5 lm/ft² in corners. In the chancel and choir stalls of Anglican churches about 7 lm/ft² is needed, while the greater significance attached to ceremonial in the Roman Catholic service calls for sanctuary illumination of 9 lm/ft².

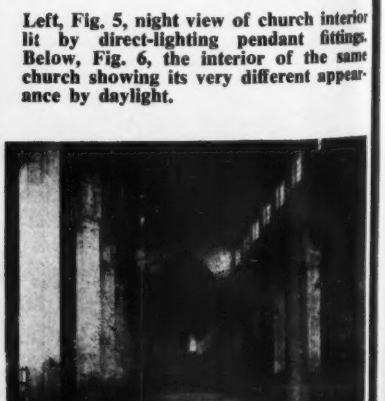
There is no tradition of dim lighting in Nonconformist churches and, since there is a more general participation in the service, an average illumination level of 6-7 lm/ft² is appropriate. The nature of the Hebrew alphabet calls for 8-10 lm/ft² for comfortable reading conditions in synagogues.

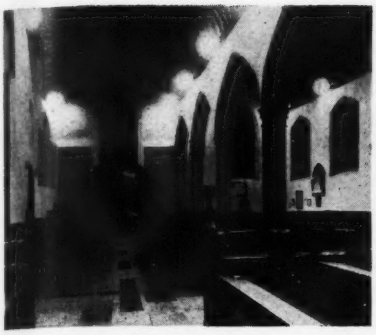
It is inevitable that in attempting to provide improved seeing conditions, in spite of limited funds (both for initial costs and for running costs), restrictions in the location of fittings to avoid damage to the fabric of the church, and the desire of some church committees to depart from the conventional, there have been many instances in which the desired visual effect has not been achieved. Some installations have been criticised because there is too much light in the upper parts of the church, others because the effect is theatrical or unnatural, and many because they fail to achieve that intangible traditional quality sometimes referred to as an "air of mystery." It is not surprising, therefore, that there is a growing insistence on the part of Anglican ecclesiastical authorities, backed by the opinion of many architects, for more consideration to be given to the preservation of an atmosphere conducive to worship and reverence.

The traditional atmosphere from the ecclesiastical



Left, Fig. 5, night view of church interior lit by direct-lighting pendant fittings. Below, Fig. 6, the interior of the same church showing its very different appearance by daylight.





Right, Fig. 7, night view of church interior, showing application of concealed lighting method where there are no features for concealing the lighting fittings. Above, Fig. 8, the same interior, seen from the chancel and pulpit.

point of view is, undoubtedly, more conducive to meditation. It is liked, too, by architects who, thinking in terms of light and shadow, naturally desire the interior form to be revealed in its full beauty. These viewpoints cannot be ignored, but there is a tendency to believe that the desired visual effect can be attained only by the use of opaque fittings emitting no upward light. But, under certain conditions, this can result in a depressing atmosphere and one having an adverse effect on the younger generation, to whom the church must look for the congregation of the future. It is, however, within the power of the lighting engineer to introduce upward light (to meet the layman's desire for a brighter aspect) while preserving the balance of light and shade and an atmosphere in keeping with the dignity of worship.

Mr. L. C. Rettig, in his paper *The Lighting of Churches* (Trans. Illum. Eng. Soc. (London) **14,** 117 (1949)), dealt at some length with the five methods of lighting that can be used for churches—direct, semi-direct, general diffusing, semi-indirect and indirect. Of course, no lighting scheme need be confined to the use of only one method: in fact, in most churches the use of a combination of two or more is essential to achieve the desired standard of lighting and to make possible a full appreciation of the building's architectural form.

The definitions of the five lighting methods are based on the light-distribution characteristics of the lighting fittings used, the upward and downward distribution for each method being defined in British Standard 398, 1948. (See Table 1).

TABLE 1.

Classification	Distribution of Light Emission of Fittings	
	Upward (per cent.)	Downward (per cent.)
Direct	0–10	90–100
Semi-direct	10–40	60–90
General diffusing	40–60	40–60
Semi-indirect	60–90	10–40
Indirect	90–100	0–10

The three methods of lighting, general diffusing, semi-indirect and indirect, have only a limited application in the lighting of old churches, and it is proposed to deal in detail only with the other two methods—direct and semi-direct. Both these methods can be applied in three ways —by pendant fittings; by reflector units mounted at high level, hidden behind beams, etc. (known as "concealed lighting"); and by "built-in lighting," in which the fittings are recessed into the ceiling.

The Use of Pendant Fittings

It is difficult to compare the results given by lighting systems in different churches, and an attempt has been made to photograph direct and semi-direct pendant systems in one church. The lighting of this church was planned originally by the architect and was effected by wrought iron, "ring-cluster" fittings, each fitted with six 25-watt naked lamps. Complaints of discomfort glare and of the illumination level resulted in lighting engineers being called in to improve the installation. In consequence, 40-watt lamps in translucent prismatic reflectors were substituted for the 25-watt naked lamps (Fig. 1). The reflectors gave semi-direct lighting, with 25 per cent. of the light going upwards and 75 per cent. downwards. The illumination level under the fittings was 4.5 lm/ft² (about 4 lm/ft² in the aisle, midway between the fittings), which was substantially higher than that provided by the original installation, and the amount of light shining upwards was less.

The installation was then converted to a direct lighting system, giving 100 per cent. downward lighting, by fixing metal covers over the prismatic reflectors (Fig. 2). The result was that the illumination level of the ceiling was reduced still further. Fig. 3—a photograph of the same church, again lit as in Fig. 2—was taken from the chancel; it shows how the cut-off shadows caused by a direct lighting system can spoil the architectural form.

and emphasises the importance of taking this factor into consideration.

Both the direct and the semi-direct installations in this church gave adequate illumination levels, and Fig. 1 shows that properly designed lighting fittings giving a small proportion of upward light can be used in a church, without destroying the atmosphere conducive to worship. The vicar of the church preferred the effect produced by the use of the semi-direct system, probably because the church was slightly brighter and had a more "friendly" aspect. When the metal covers were used, the lighting seemed "harder" and produced harsh shadows and, although the cut-off eliminated glare at the critical angles, the luminance of the light sources tended to be "felt," instead of seen.

Much has been said concerning the use of light and shade to give emphasis to architectural form, but the illumination of the nave and aisles of a church of traditional form by pendant fittings does not give the lighting designer much scope. In most churches, the location of fittings is dictated by the need to keep the formation in symmetry with the architecture, as expressed in the form of the arches, and the need to use the minimum number of fittings to reduce installation and running costs. Moreover, the height of the roof of the nave usually makes difficult the wiring of pendants suspended from it, and in most churches the wiring can be concealed effectively only along the wall plates at eaves level. On the other hand, there is seldom any difficulty in running wiring along the aisle sides of the arches just below the junctures of the roofs of the aisles with the walls of the nave. These considerations have led to the nave and aisles of many churches being lit by pendants suspended between the arches.

It would appear, therefore, that all the lighting designer can do, in his attempt to give expression to the architectural form, is to decide whether direct or semi-direct pendants should be used and whether they should be in the form of single units or cluster fittings holding a number of small-wattage lamps, as in Figs. 1, 2 and 3. However, the appearance of a church interior can be completely altered by the treatment of the east end, and in many churches the attainment of visual conditions that satisfy all the requirements is achieved by what may

Fig. 9, night view of church interior showing good application of the concealed lighting method.

seem to be small factors relating to the positioning of the fittings (including their height) and to the provision of supplementary lighting. The designer usually has the choice of suspending the fittings in the nave from brackets mounted at eaves level over the apices of the arches or of hanging them in the aisles. Other factors permitting, the latter arrangement is best, as the nave, being the important architectural feature, is then illuminated by a flow of light from the aisles, similar to that of natural daylight. Fig. 4 shows an example of a pendant installation of this type, with semi-direct, translucent, enclosed fittings, suspended on the aisle side of the arches. It will be seen that the light and shadow effects are similar to those which one would expect to occur during the day.

In Fig. 5 is seen a church lit by single direct-lighting pendants giving no upward light. It is often said that an installation of this type helps to reveal the architectural form, but if the fittings are mounted at a height sufficient to prevent shadows falling on the congregation's hymn books, there is a tendency for a pronounced

Figs. 10 and 11, the chancel and altar of the church seen in Figs. 1, 2 and 3. In both photos the church is lit by the fittings with semi-direct translucent reflectors, but in the left-hand photo there is supplementary lighting for the altar.

"tunnel effect" to occur. As can be seen in the photograph, the visual effect is such as is often referred to as giving "an air of mystery." A daylight photograph of the same church (Fig. 6) shows that the lighting by night and by day bear little resemblance.

Semi-direct lighting systems are usually most suitable for non-conformist churches, though sometimes (for example, when it is desirable to screen the light sources from the occupants of galleries) direct-lighting fittings may be used. The architecture of these churches generally calls for some upward light and a fairly bright aspect is in keeping with the nature of the service.

Concealed Lighting

Concealed lighting is now generally condemned by Anglican diocesan authorities on the grounds that it is theatrical, that it tends to give a foreshortened appearance, and that it does not provide an atmosphere suitable for worship. There are, however, many churches with architectural features particularly suitable for concealed lighting systems, and it is possible to design these intallations so that they give the desired atmosphere, as well as the light and shade needed to give expression to the architectural form.

Unfortunately, concealed lighting lends itself to abuse and there have been many bad examples of its use. This is because it appears simple: to the uninitiated, it seems to comprise merely the use of open-type reflectors mounted at eaves level and, as the wiring installation is usually easy and the cost of the fittings less than that of pendants, it is an attractive system to church committees. There are many types of lighting equipment which can be used for concealed lighting—from open-type reflectors giving various light distributions to trough units with diffusing cover glasses. An essential requirement is a universally adjustable mounting. Semi-direct reflectors, giving a small upward light component, can often be used: they prevent a distorted visual effect and the cut-off shadows they produce are softer and less conspicuous than those given by opaque direct-lighting reflectors. Concealed lighting should be used only where the structural design makes possible adequate concealment of the fittings. It is frequently necessary to tilt the units, so that their light is cast downwards and towards the chancel, to cover uniformly the area below and to reduce cut-off shadows on the side walls. Special care must be taken, however, to avoid glare to the occupant of the pulpit, for, while the light sources may be hidden from the congregation, all are usually visible from the east end. Another result is that the west end may have a depressing appearance; and it is this, together with the glare factor, which forms the basis of the many criticisms of concealed lighting.

There is a tendency with pendant lighting systems for the illumination level to be greatest towards the centre of the church; with concealed lighting, however, the inclination of the reflectors often results in a gradual build-up of the illumination level towards the chancel, at the expense of that at the west end. It will generally be found that the illumination level over the rear seats is inadequate and that additional fittings are needed there to prevent this inequality. These extra fittings can often be installed to shine in the opposite direction to the remainder, thereby giving not only the required build-up in the illumination level, but also lighting the west end wall by "spilt light." This makes the interior seem brighter when seen from the chancel and helps to reduce the apparent strength of the light sources when seen from the pulpit, by reducing the amount of contrast between these sources and their background.

Fig. 7 is a photograph taken at night showing the application of concealed lighting to a church interior which has no architectural features for concealing the fittings; they are, as a result, visible both by day and by night. Fig. 8 is a view of the same church showing the appearance of the interior as seen by artificial light from the chancel and pulpit. It illustrates the grounds for the criticisms levelled against installations of this type.

Fig. 9 illustrates the use of concealed lighting by trough fittings with diffusing glass covers mounted on the sides of the cross members of the roof. This arrangement has the advantage, in churches with low roofs, that the units can be brought out from the wall and adjusted so that the light is emitted downwards, thereby preventing the preacher from being subjected to glare. It will be seen from this photograph that, with this lighting system, an atmosphere suitable for worship can be provided without destroying the architectural form of the interior.

The lighting of chancels is another controversial subject. The presence of visible light sources tends to detract from visibility at the east end. Concealed lighting is, therefore, generally used, normally by direct-lighting units hidden behind the dividing arch and roof trusses. There are some designers, however, who consider this form of lighting theatrical and who advocate the use of direct lighting pendants.

Figs. 10 and 11 show the altar of the church seen in Figs. 1, 2 and 3, with and without supplementary altar lighting. A comparison of the photographs of this church indicates how the introduction of additional altar lighting changes its whole appearance. The combined use of pendants and concealed lighting can often solve the problem of maintaining an atmosphere of reverence while meeting the visual requirements for the service.

Tubular fluorescent lamps are not generally suitable for the lighting of old churches, although tubular light sources can often be used with advantage for the lighting of sanctuaries, particularly those which have an apse.

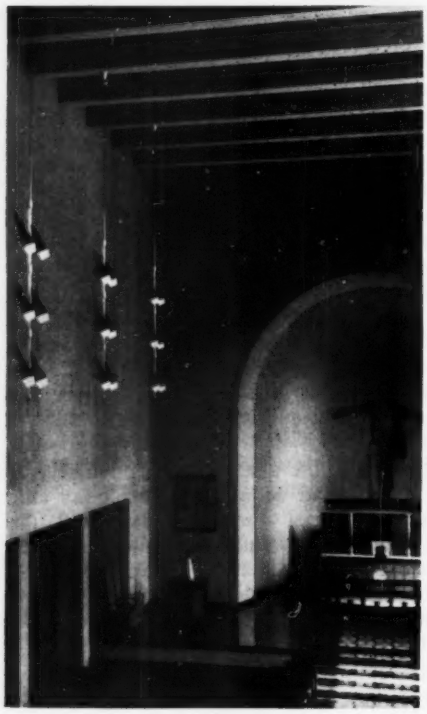
Built-In Lighting

The use of built-in lighting is most suitable for lighting Nonconformist churches, though sometimes it is possible to make structural alterations to the roof which will make possible the use of this method for the re-lighting of Anglican churches, too. Built-in lighting by the direct-lighting method is usually carried out by means of reflectors mounted over apertures cut in the ceiling glazed with flat diffusing glass. It is apt to give an austere effect. Built-in lighting by the semi-direct system is applied similarly, but dished cover glasses or scientifically designed prismatic glassware are used. These covers project sufficiently far below the ceiling to allow a small horizontal light component to light the surrounding surface. Built-in lighting installations have the advantage that relamping and maintenance can be carried out from above the ceiling.

[The writer would like to thank Canon Fisher and the Reverend J. R. Carrick for the valuable assistance given and the facilities afforded for the photographing of the churches which have been illustrated.]

CHURCH LIGHTING ABROAD *(continued)*

NORWAY.—Lillestrøm church (below). Built in the 1930s, a new lighting scheme was carried out in 1953. The nave is lit by a row of fittings along one side wall. Each fitting has six 100-watt tungsten lamps in separate reflectors of satin-finish brass.

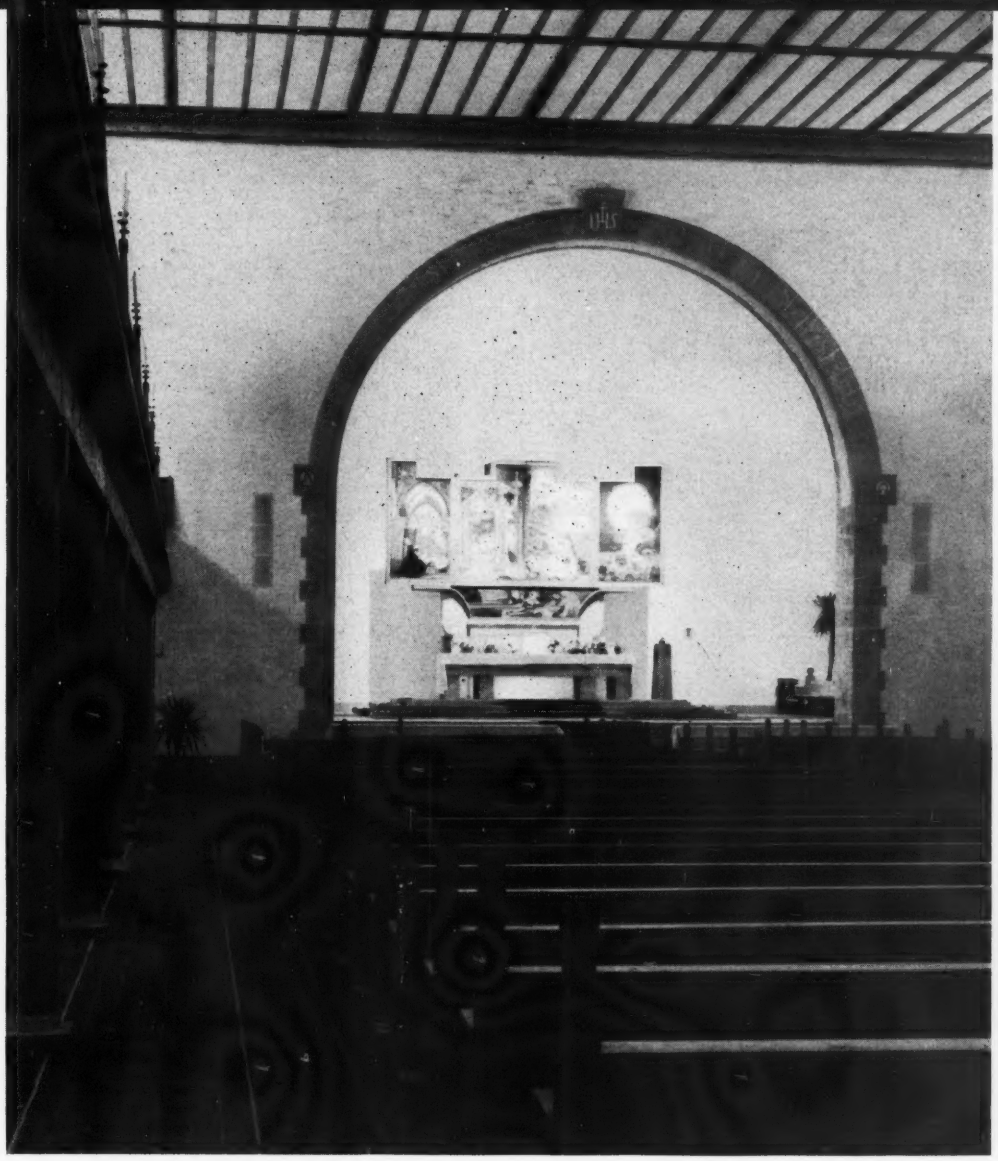


FRANCE.—Church at Vignory (below). The nave is lit by 18 fluorescent lamps, fixed in metal reflectors in the galleries and directed upwards. The illumination level is about 4 lm/ft.². The choir is lit by two 300-watt floodlights, fixed to the piers, about 18ft. above floor level.

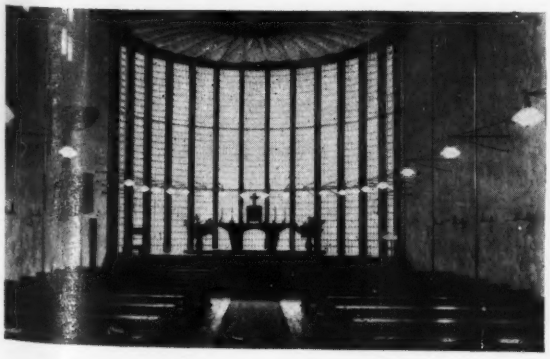
FINLAND.—Congregation hall of church seen at top of page 161. It is lit by diabolo-shaped wall fittings of polished brass, and suspended fittings, also of polished brass, with frosted-glass covers. The dais is lit by a row of spotlights.

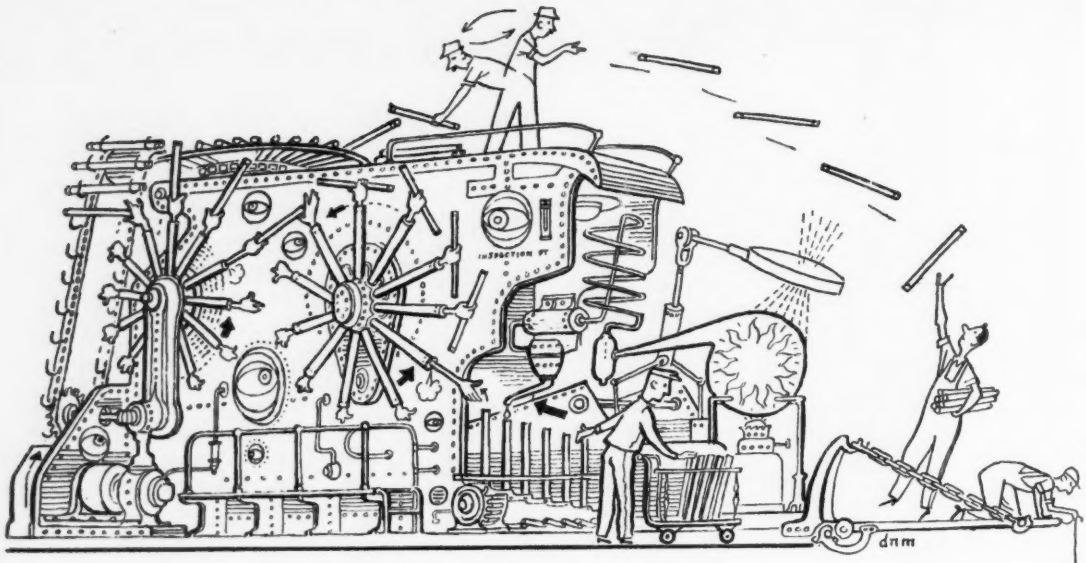
GERMANY.—Church of St. Michael, Kirchenlamitz (above). Good example of small German village church, designed so that in both natural and artificial light the altar is well emphasised. In addition to fittings suspended from the ceiling, there are wrought-iron wall brackets holding candle-type lamps. The spotlights for the altar are concealed by the suspended ceiling.

GERMANY



ST. KUNIGUND CHURCH, BAMBERG (above).—The nave is lit from the coffered ceiling, above which are rows of reflector units each housing two 100-watt tungsten lamps. There are also a number of wall fittings also holding two 100-watt lamps, while the apse is lit by three spotlights and the altar by four 500-watt projectors. The lighting can be dimmed when required. CHURCH IN GEILENKIRCHEN-HÜNSHOVEN (below left).—An unusual installation in an old church, with lighting fittings suspended from wrought-iron brackets projecting from the side walls and from the glass wall to the apse. ST. ELISABETH NÜRNBERG (below right).—Rebuilt since the war, the dome is lit indirectly by concealed fittings. Above a laylight under the cupola are seven powerful projectors, with mirror-glass reflectors, which flood the main body of the church with light.





Daylight, Warm White, De-Luxe Warm White, Natural, Colour Matching White, Red, Blue, Green, Yellow, and we'd have made a sky blue pink with black dots if there was a market for it!

We stop at nothing . . .

. . . to produce fluorescent tubes that nobody can better, and that you can sell at a good competitive price. Sieray tubes have all the selling points — glare free, very low running costs, virtually shadowless, highly efficient and of course we have the complete range in colour, shape and size. The demand for fluorescent lighting is not just healthy — it's boisterous; shops, offices, factories and now householders are all after them. The Siemens organisation is geared to meet that demand. *For full details drop in on your local branch or write to us.*

SIEMENS BROTHERS

SIEMENS BROTHERS & CO., LIMITED

Member of the A.E.I. Group of Companies

38-39 Upper Thames Street, London, E.C.4

Branches at: BELFAST, BIRMINGHAM, BRISTOL, CARDIFF, DUBLIN, EDINBURGH, GLASGOW, IPSWICH, LEEDS, LEICESTER, LIVERPOOL, MANCHESTER, NEWCASTLE-ON-TYNE, NOTTINGHAM, PRESTON, READING, SHEFFIELD, SOUTHAMPTON.

Lighting Abstracts

OPTICS AND PHOTOMETRY

311. **Dark Adaptation and Miners' Nystagmus.** 612.845
W. J. WELLWOOD FERGUSON, *Trans. Illum. Eng. Soc. (London)*, **21,** 42-45 (No. 2, 1956).

A report on the continuation of work on dark adaptation and miners' nystagmus referred to in a previous paper by the author. Results are given of dark adaptation tests of 150 miners with nystagmus and it is concluded that there is a general tendency for the raised dark adaptation threshold found in cases of miners' nystagmus to improve over a long period but not in a manner corresponding in any way with improvements in the other signs and symptoms of the condition. Mention is made of a further investigation in progress on the effect of miners' nystagmus on light adaptation. Preliminary results suggest that the derangement of dark adaptation is accompanied by a measurable defect in adaptation to light. W. R.

LAMPS AND FITTINGS

621.327.4

312. **A study of lamp mortality and lumen depreciation of mercury lamps as a guide to relamping programs.**
W. S. TILL and M. E. HASKINS, Jr., *Illum. Eng.*, **51,** 277-286 (*March*, 1956).

Basic data on lamp costs, mortality rates and lumen depreciation for a number of mercury and fluorescent-mercury lamps enable an assessment to be made of the relative economics of three methods of lamp replacement. The three methods (random, retirement and group) are listed and the factors influencing mortality and lumen maintenance are briefly described. The economics are assessed in terms of total relamping costs rather than the cost of light. Eleven sample cases are considered. In practically all cases some kind of systematic relamping plan is cheaper than random relamping. In most cases group replacement using new lamps to replace early burnouts proves most favourable. P. P.

621.327.43

313. **Effect of bulb wall temperatures on fluorescent lamp parameters.**
C. W. JEROME, *Illum. Eng.*, **51,** 205-211 (*Feb.*, 1956).

The voltage, wattage, lumen output and luminous efficiency of nine types of fluorescent lamp have been measured with the bulb wall temperatures of the lamps controlled by a water bath in the range 20-50 deg. C. It was found that with increasing operating current all the parameters reached their maxima at higher bulb wall temperatures. It was also found that the larger the bulb diameter, the higher the bulb temperature for maximum efficiency and that argon-filled lamps reached maximum efficiency at higher bulb wall temperatures than did krypton-filled lamps. A relationship was established between the bulb wall temperature and the ambient temperature at various operating currents. P. P.

535.37

314. **On the effect of various metal electrodes on brightness waves in electro-luminescence.**
G. DESTRIAU, *Illum. Eng.*, **51,** 197-201 (*Feb.*, 1956).

Characteristics of the shape of the light : time curve of an electro-luminescent cell are summarised and the dependence of these characteristics on the frequency and voltage of the supply and the thickness of the phosphor layer are briefly discussed. The effect of the metal backing plate on these characteristics is reported in detail. It is shown that light emission from the cell depends on the work function of the metal electrode. It is suggested that a gain in light emission might be obtained if this emission could be divided equally between the two half-cycles of the alternating current supply. P. P.

315. **Elongated carbon arc sources.** 621.325
S. M. SEGAL, *Illum. Eng.*, **51,** 223-229 (*Feb.*, 1956).

Experiments are described associated with the preliminary stages of development of elongated carbon arc lamps suitable for use as floodlights or in cinematograph projectors. Carbons having a cross-section 32 x 3 mm. and 32 x 6 mm. were studied. The problem of maintaining the arc with one and two negative electrodes, the use of water-cooled jaws and the effect of rare earth cores are discussed. Comparisons are made with a 25 x 1.5 mm. mercury capillary arc which has the advantage of rectangular shape but which is of relatively low luminance. P. P.

621.327.43

316. **Phosphor stabilisation for better lamp performance.**
H. H. HOMER, K. H. BUTLER and M. J. BERGIN, *Illum. Eng.*, **51,** 214-219 (*Feb.*, 1956).

A chemical treatment for calcium halophosphate phosphors has been developed which results in increased initial lumen efficiency and substantially improved lumen maintenance. It is claimed that "stabilisation" produces a gain of 1,500,000 lumen-hours during the life of a 40-watt lamp. The Butler-Lowry empirical equation expressing the loss of light output during lamp life has been modified to express the new decay curve. The major change is in the term associated with photochemical deterioration of the phosphor by 1,849 deg. A radiation. Measurements on the stabilised phosphor show it to be both brighter and of a higher reflectivity than the untreated phosphor. P. P.

LIGHTING

317. **Comfort in lighting.** 612.843.367
S. K. GUTH, *Illum. Eng.*, **51,** 166-168 (*Feb.*, 1956).

Summarises the discussions on discomfort glare at the Zurich meeting of the C.I.E. culminating in a proposal that the C.I.E. should prepare a set of international glare tables. A simplified glare formula representing the mean of the experimental data obtained by a number of investigators was proposed as a basis for the tables. Two forms of presentation of the tables are under consideration, one being similar to that developed by Harrison and Meaker but using Visual Comfort Indices while the other is in terms of the limiting source luminances for various room dimensions and mounting heights. P. P.

318. **Lighting and protection for an art museum.** 628.972
H. P. SCOTT, *Electrical Construction and Maintenance*, **55,** 76-83 (*March*, 1956).

Describes the lighting and the protection arrangements at the Sterling and Francine Clark Art Institute, Williamstown, Mass. Protection devices include : photo-electric smoke detection, temperature and humidity control for canvas protection, photo-cell-activated skylight louvres to prevent fading from direct sunlight. The various lighting methods are described including: combined incandescent and fluorescent lighting with remote switching and dimming, luminous ceilings, indirect coffers, recessed downlights, chandeliers and other special lighting treatments. A manually operated movable maintenance car which gives access to all lamps above the main suspended ceiling is described. W. R.

I.E.S. ACTIVITIES

Birmingham Centre

A meeting of the Birmingham Centre took place in Coventry on March 22 in the new showrooms of the East Midlands Electricity Board, when Mr. K. R. Alsop, Chief Radiologist of the Bristol Aeroplane Co., Ltd., lectured on X-rays in industry.

Mr. Alsop began his lecture by giving a brief historical survey of X-rays from their discovery by Röntgen in 1895 tracing the development of equipment and application to the present day. It was interesting to note that the first industrial application of consequence took place during the 1914-18 war when X-rays were used in the inspection of propellers and shells.

The methods used to produce X-rays were then described, the intricacies of the equipment necessary for the control of the wave-path, its strength and the final production of a visible image being dealt with. Two methods were in general use, radiography in which the image was produced as a photograph on a specially prepared plate, and fluoroscophy where the image appeared on a screen.

The lecturer then detailed various objects to which this method of testing was particularly applicable, pointing out that it was a non-destructive test with much more positive results than other systems. He divided test objects into roughly three groups. The first group included all cast structures with such possible defects as porosity, blow-holes, shrinkage, etc. Group two included welds and welded fabrications. The third group covered a wide range of miscellaneous objects including cables, radio valves, transformer windings, heating elements, etc. Illustrations of each type were shown.

Mr. Alsop also pointed out that the plastics industry was now becoming increasingly interested in this method of testing its products.

The subject proved to be extremely fascinating, and it was with reluctance that the chairman closed the meeting after a very hearty vote of thanks had been accorded Mr. Alsop by the members and guests present.

Liverpool Centre

The annual luncheon of the Liverpool Centre was held on April 9 at the Exchange Hotel, Liverpool, under the chairmanship of Mr. G. L. Butler.

The function was graced by the attendance of the Deputy Lord Mayor of Liverpool, Alderman A. Griffin, J.P., the president of the Society, Mr. A. G. Higgins, who very ably proposed the toast of the City and Port of Liverpool, and a number of friends representing allied interests on Merseyside.

Mr. O. W. Humphreys, Director of Research of the General Electric Co., Ltd., gave an inspiring and thought-provoking address which discussed many of the problems which are so much to the front in connection with technical education, the recruitment of suitable technical staff and the infusion of new blood into industry.

Mr. Humphreys emphasised the important part industry had to play in these times of national difficulties with emphasis on the need for scientists and production specialists who were more difficult to recruit than the professional classes.

A balance, he said, must always be maintained between the arts and sciences; an arts graduate could often bring a refreshing broader view on scientific problems and particularly on problems of management. Many factors influence the decision of our young people concerning future careers. Wrong decisions were sometimes made because of the influence of headmasters drawn mainly from the classical ranks who were out of sympathy with scientific thought. On the other hand, some science masters lacked a sense of vocation and one encountered those who had failed in other jobs. Mr. Humphreys emphasised the point that a student would tend to assess any profession by the representatives of it with whom he had come into contact. Many schools lacked the facilities to present science teaching in an attractive way and the universities could make a much greater contribution to the problem by really teaching people to think as opposed to the function of imparting information. Industry itself had to play its part in making the best use of the graduates who joined their staffs. Too seldom did a company direct their further training and one encountered instances of insufficient care being taken to allocate individuals to the work which their temperament and training best fitted them. There was also a tendency to follow a policy of specialisation too early in a man's career and an equally undesirable tendency to keep a man in the same job for ten years because he was good at it.

There was an outstanding need, said Mr. Humphreys, to look at the problem as a whole and secure closer co-operation between those who used graduates and those who trained them. Public opinion was an important medium through

The Liverpool Centre annual luncheon on April 19. Left to right: Mr. J. L. McCauley, Mr. O. W. Humphries, Deputy Lord Mayor of Liverpool, Mr. G. L. Butler, The President, and Mr. F. J. Burns.

which such ideas as these should be ventilated and it should be realised by the public at large that our country would not readily get out of its present difficulties until there was a decrease in the ratio between what a man produced and what he used.

Nottingham Centre

The Nottingham Centre was privileged on April 26 to hear a paper by Mr. H. Carpenter, of Blackpool, on the subject of exterior illuminations. Mr. Carpenter enthralled the audience with details of decorative illuminations, a practice reputed to have been started by the Chinese and Japanese many centuries ago. He then gave impressive details of the Blackpool illuminations and exhibited 170 coloured lantern slides. Visitors from Skegness, Matlock, Bolsover, etc., all of whom instal decorative illuminations, were most impressed and delighted with the information imparted. A very lively discussion which followed was opened by Mr. N. C. Slater, and a vote of thanks to the speaker was proposed by Mr. G. C. Small.

FORTHCOMING EVENTS

July 25th

TRANSVAAL.—"Cold Cathode Lighting," by N. Flekser. (At Room 95, Public Library, Johannesburg.) 8 p.m.

September 26th

TRANSVAAL.—Chairman's Address. "Where Does South Africa Stand in Regard to Lighting?" (At Room 95, Public Library, Johannesburg.) 8 p.m.

SUSTAINING MEMBERS
of the
ILLUMINATING ENGINEERING SOCIETY

A.E.I. Lamp and Lighting Co.
J. Aikman and Co., Ltd.
Aladdin Lighting Ltd.
Allom Brothers Ltd.
Aurora Lamps Ltd.
Barlow and Young Ltd.
T. Beadle and Co., Ltd.
Benjamin Electric Ltd.
City of Birmingham Education Department.
Bolton Corporation Lighting Department.
British Electric Lamps Ltd.
British Electrical Development Association.
British General Electric Co. (Pty.) Ltd., Johannesburg.
British Optical Association.
Cartwright, J. T. and Sons, Ltd.
Central Electricity Authority.
Chance Bros. and Co., Ltd.
Claude Neon Lights of New Zealand Ltd.
E. Clegg and Sons, Ltd.
Courtney, Pope (Electrical) Ltd.
Crompton Parkinson Ltd.
R. and A. G. Crossland Ltd.
Cryselco Ltd.
George Davidson and Co., Ltd.
Hubert Davies and Co., Ltd., Johannesburg.
Dominec (Pty.) Ltd., Johannesburg.
Docker Bros.
Dodd and Oulton Ltd.
Dorman and Smith Ltd.
Downes and Davies Ltd.
Drake and Gorham Wholesale Ltd.
Eastern Electricity Board.
Eastern Gas Board.
East Midlands Electricity Board.
Corporation of the City and Royal Burgh of Edinburgh.
Edmundsons Electric Co., Ltd.
E.G.S. Company Ltd.
Ekco-Ensign Electric Ltd.
Electrical Components Ltd.
Electric Lamp Manufacturers Association.
Electric Street Lighting Apparatus Co., Ltd.
George Ellison Ltd.
Engineering and Lighting Equipment Co., Ltd.
Engineering Service Installations Ltd.
Evans Electroselenium Ltd.
The Ever Ready Co. (Great Britain) Ltd.
Falk, Stadelmann and Co., Ltd.
Falks Electrical Supplies (S.A.) (Pty.) Ltd., Johannesburg.
H. W. Field and Son Ltd.
Foster Electrical Supplies Ltd.
Fred Reynolds Ltd.
B. French Ltd.
Fulford Brown Bros. (1929) Ltd.
Gas Council.
General Electric Co., Ltd.
Girdlestone and Co., Ltd.
Donald Grant and Sons Ltd.
Hailwood and Ackroyd Ltd.
W. T. Hellaby and Co., Ltd.
Heyes and Co., Ltd.
S. H. Heywood and Co., Ltd.
Hirst, Ibbetson and Taylor Ltd.
Hivac Ltd.
Holland House Electrical Co., Ltd.
Holophane Ltd.
Humber Ltd.
Hume, Atkins and Co., Ltd.
Imperial Chemical Industries Ltd. (Metals Division).
Imperial Chemical Industries Ltd. (Paints Division).
Imperial Chemical Industries Ltd. (Plastics Division).
Inductive Appliances Ltd.
J. A. Jobling and Co., Ltd.
James Kilpatrick and Son Ltd.
Knightshades Ltd.
Linolite Ltd.
Littlewoods Pools, Central Maintenance Department.
Corporation of Liverpool.
The Lodge Fittings Co., Ltd.
London Electric Firm Ltd.
London Electricity Board.
Joseph Lucas Ltd.
Luxram Electric Ltd.
Marryat and Place Ltd.
Merseyside and North Wales Electricity Board.
Metallic Seamless Tube Co., Ltd.
Metropolitan-Vickers (S.A.) (Pty.) Ltd., Johannesburg.
Midland Electric Installation Co.
Midlands Electricity Board.
Morgan Crucible Co., Ltd.
Mortimer Gall and Co., Ltd.
Municipal Electricity Department, Singapore.
Neon Fluorescent (S.A.) Ltd., Johannesburg.
Nettle Accessories Ltd.
New Era Lighting Industries (Pty.) Ltd., Johannesburg.
Newey and Eyre Ltd.
North-Eastern Electricity Board.
North-Western Electricity Board.
Oldham Corporation Street Lighting Dept.
Oldham and Son Ltd.
Philips Electrical Ltd.
S. A. Philips (Pty.) Ltd., Johannesburg.
F. H. Pride Ltd.
Progress Electric Fitting Co. (Pty.) Ltd., Johannesburg.
Prudential Assurance Co., Ltd.
Albert E. Reed and Co., Ltd.
Revo Electric Co., Ltd.
John Riley and Son (Electrical) Ltd.
J. Rivlin Ltd.
Robinson, King and British Challenge Glazing Co., Ltd.
Rogers, G. S. (Pty.) Ltd., Johannesburg.
Rowe Bros. and Co., Ltd.
Rowlands Electrical Accessories Ltd.
Satchwell and Gittings Ltd.
James Scott and Co., Ltd.
Siemens Brothers British (Pty.) Ltd. Johannesburg.
Siemens Brothers and Co., Ltd.
Sign Components Ltd.
Simplex Electric Co.
Simplex Electric Co. (S.A.) Ltd., Transvaal.
S.M.D. Manufacturing Co. (Pty.) Ltd., Natal.
Herman Smith Smithlite Ltd.
Wm. Allan Smith and Co., Ltd.
W. H. Smith and Co. (Electrical Engineers) Ltd.
J. G. Sneath Ltd.
South-Eastern Electricity Board.
Southern Electricity Board.
South of Scotland Electricity Board.
South Wales Electricity Board.
South-Western Electricity Board
W. H. Stone and Co. (Cardiff) Ltd.
Strand Electric and Engineering Co., Ltd.
Strong Electric Corporation (Great Britain) Ltd.
Wm. Sugg and Co., Ltd.
Thermo-Plastics Ltd.
Thorn Electrical Industries Ltd.
Thorn Electrical Industries (S.A.) Pty., Ltd., Johannesburg.
F. W. Thorpe Ltd.
Troughton and Young, Ltd.
Tucker and Edgar Ltd.
Verity's Ltd.
Walsall Conduits Ltd.
J. Walton (Electrical) Ltd.
Wardle Engineering Co., Ltd.
J. M. Webber and Co., Ltd.
Whitworth Electric Lamp Co., Ltd.
Wokingham Plastics Ltd.
A. J. Wright (Electrical) Ltd.
Yorkshire Electricity Board.
Z Electric Lamp and Supplies Co., Ltd.

Personal

MR. CYRIL BAYLIFFE has been appointed as lighting superintendent of Oldham in succession to MR. C. WORSWICK, who is retiring. Mr. Bayliffe has been with the Corporation for 30 years and is a Registered Lighting Engineer (I.E.S.).

MR. P. ROSS has recently joined The Benjamin Electric, Ltd., as assistant to MR. G. O. BATEMAN, who controls the government and railways department of the company. Mr. Ross will operate principally in the North of England and Scotland.

MR. CHARLES J. KING has been appointed to the newly created position of Midlands area manager of Lumenated Ceilings Ltd. Until suitable showrooms are obtained in the Midlands, he can be contacted through the Birmingham Engineering Centre and Exchange. For the past five years Mr. King has been in private practice as a consulting engineer and editor of the *Scottish Electrical Engineer*. He has an extensive knowledge of lighting, having been an area engineer for the Lighting Service Bureau of Scotland.

Siemens Brothers and Co., Ltd., announce the appointments of sales manager and chief engineer in their recently formed lamp and lighting division. This new division of the company has been formed to absorb the activities of the lamp, lighting fittings and lighting engineering departments of the former company, Siemens Electric Lamps and Supplies, Ltd., MR. J. L. ILSLEY has been appointed sales manager and MR. S. A. COOK has the appointment of chief engineer. Mr. Ilsley joined Siemens Electric Lamps and Supplies, Ltd., in 1946 as personal assistant to the general sales manager, and since 1951 has been manager of the lamp department. Mr. Cook has had considerable experience in the design, development and production of electrical and electronic products, both in this country and in the United States.

At the annual general meeting of the British Electrical Development Association in the Savoy Hotel on Tuesday, April 24, VISCOUNT CHANDOS, D.S.O., M.C., was re-elected president for the year 1956/57.

The following were elected as vice-presidents of E.D.A. in recognition of their past services to the Association: MR. H. J. RANDALL, chairman, London Electricity Board; Mr. S. F. STEWARD, ex-chairman, South Western Electricity Board, and MR. E. R. WILKINSON, former chief commercial officer, Central Electricity Authority, and MR. E. H. MULLENS, ex-chairman, North Eastern Electricity Board. At the first meeting of the new council MR. D. BELLAMY, chairman of the Yorkshire Electricity Board, was elected chairman, and MR. W. S. LEWIS, chairman, Midlands Electricity Board, was appointed vice-chairman for the current year.

The A.E.I. Lamp and Lighting Company Ltd. has announced the following appointments:—

MR. W. C. HUSTON: Manager, Lamp Sales Division. Mr. Huston was appointed Manager, BTH Lighting Department, in 1940 and became Marketing Manager of the Lamp and Lighting Department in 1949. He is also a director of Claude-General Neon Signs.

MR. C. W. M. PHILLIPS: Manager, Lighting Sales Division, Mr. Phillips received his engineering training with the BTH Company. He was appointed Assistant Manager of the BTH Lighting Department in 1948 and Manager in 1950.

MR. O. W. J. FARMER: Manager, Publicity Division. Mr. Farmer joined the Advertising Department of the BTH Company in 1945, was appointed Deputy Manager in 1948 and Manager in 1952.

MR. A. H. GOUDE: Manager, Head Office Sales. Mr. Goude's responsibilities include the supervision of lamp and lighting sales to government departments and the railways. He joined the BTH Coventry Works in 1914 and was in charge of Lamp and Lighting Sales in the Provincial Area between 1949 and 1955.

MR. R. P. B. VOADEN: Manager, Midland Region. Mr. Voaden joined the BTH Company as an apprentice in 1917. Between 1933 and 1949 he was an estimating engineer. After spending a period at BTH, Cambridge Office, he returned to Birmingham as Assistant Manager in 1953 and became Assistant District Manager in 1954.

MR. G. W. NATTRASS: Manager, North-East Region. After serving with Metropolitan-Vickers Supplies Ltd. in Sheffield, Mr. Nattrass joined the Edison Swan Electric Co. Ltd. in 1930 as a salesman in the Tees-side Area. He was appointed Newcastle District Manager in 1949.

MR. E. J. MELVILLE: Manager, Southern Region. Mr. Melville joined the BTH Company in 1930 and was Manager, Northern Area Lamp and Lighting Sales between 1935 and 1947. He was appointed Sales Manager of the Southern Area in 1947.

MR. J. M. ANDERSON: Manager, Scotland and Northern Ireland Region. Mr. Anderson was Assistant Dept. Manager, Lighting Fittings and Domestic Appliances at the G.E.C. Glasgow Office between 1910 and 1915. After war service he joined the Metropolitan-Vickers Electrical Co. Ltd., Glasgow, and was appointed Superintendent, Lamp and Lighting Department, Scotland, 1930.

MR. F. C. TYRRELL: Manager, North-West Region. Mr. Tyrrell was with Siemens Ltd. from 1919 to 1923 when he joined the Metropolitan-Vickers Electrical Co. Ltd. at Southampton. He became their Lamp Sales Superintendent from Bristol and S. Wales area and in 1933 moved to Metro-Vick, Manchester Office, covering the North of England and Ireland.

MR. S. G. TURNER: Manager, South-West Region. Mr. Turner was Lamp and Lighting Superintendent, Cardiff, of the Metropolitan-Vickers Electrical Co. Ltd. between 1942 and 1953, when he was appointed Superintendent, Lamp and Lighting Department, London.

Situations

Vacant

Applications are invited for the appointment of SENIOR TECHNICAL ASSISTANT. Salary £710-£885 per annum (A.P.T. IV).

Applicants should have a sound knowledge of all aspects of lighting (interior and exterior), including floodlighting and particularly street lighting. Preference will be given to those possessing the Intermediate or Final City and Guilds Certificate in Illuminating Engineering.

The person appointed will be responsible for all the work of the Laboratory (including outdoor night testing), the preparation of lighting schemes, the compilation and maintenance of technical records and information.

Applications, together with references, to be addressed to the City Lighting Engineer, 19, Highfield Street, Liverpool 3, to be received by the 30th June, 1956.

The appointment, in which abnormal hours are a recognised condition of service, is superannuable and subject to the Standing Orders of the City Council.

There is a vacancy in the Lamp Engineering Department at Rugby for an HONOURS GRADUATE PHYSICIST OR ELECTRICAL ENGINEER for work concerned with the testing of electric lamps. This testing involves measurements of light output, life performance and other characteristics of a wide variety of filament and discharge lamps, both established and development types, under various controlled conditions. The wide scope of the work offers possibilities of rapid advancement. Applicants are invited to write to the Manager, Lamp Engineering Department, British Thomson-Houston Co., Ltd., Rugby, giving details of their age, qualifications and experience, quoting reference LT.

DESIGNER with knowledge of street lighting required by electrical manufacturing company in Manchester area. Pension scheme and canteen facilities. 5-day week. Full particulars of experience and salary to Box No. 918.

Ecko-Ensign Electric Ltd., London, require LIGHTING SALES ENGINEER to contact consultants, etc. He must be well educated and conversant with modern methods. Write to BOX J.73, Willings, 362, Grays Inn Road, W.C.1.

Veritys Ltd. have scope in their organisation for first-class Lighting Fittings REPRESENTATIVE for London and Manchester areas. The positions are permanent and pensionable to the right type of men. Full details to—Sales Director, Veritys Ltd., Brettenham House, Lancaster Place, London, Strand, W.C.2.

ASSISTANT LIGHTING ENGINEERS

Interesting jobs available in Lighting Department of progressive Company leading to senior posts (technical representation, branch engineers, etc.). For men aged 20-30, preferably with technical education. Fee-paid tuition for professional studies. Write, stating age, experience, and salary required, to Chief Lighting Engineer, Falk, Stadelmann and Co., Ltd., 91, Farringdon Road, E.C.1.

Crompton Parkinson Ltd., Doncaster, invite applications for the following vacancies:—

(1) DESIGNER/DRAUGHTSMAN in their Fractional horsepower motor Drawing Office. These vacancies provide excellent opportunities for young men of approximately 25 years of age, who have a sound training in mechanical engineering and who have experience in the design of light machinery.

(2) DESIGN ENGINEER to develop and progress original designs for fluorescent lighting fittings, including special types and those intended for mass production. Specialised experience in this field is not essential, but this opportunity is eminently suitable for an engineer with imagination and progressive ideas.

These positions offer splendid opportunities for men with ability, and a generous salary is envisaged. There is ample scope for advancement within the organisation, and the Company operates a Superannuation Fund to which employees contribute when eligible. Write, in confidence, to the Personnel Officer, giving details of qualifications, experience and age.

Trade Notes

As from June 1, 1956, the trading activities of Siemens Electric Lamps and Supplies Ltd. are being integrated with those of Siemens Brothers and Co., Ltd., the parent company. This is being done in order to facilitate administration, to prepare for further development of business, and to increase the scope for efficient handling. Siemens Brothers and Co., Ltd., are taking over the assets and liabilities and the entire staff of Siemens Electric Lamps and Supplies Ltd. and will continue to conduct business from the various premises hitherto used by Siemens Electric Lamps and Supplies Ltd. On and after June 1, 1956, therefore, all orders, inquiries, correspondence, etc., relating to the business of Siemens Electric Lamps and Supplies Ltd. should be addressed to Siemens Brothers and Co., Ltd., but at the same address as hitherto.

A new lamps and lighting exhibition opened to the public at the Mazda Showroom, Crown House, on May 8, when the A.E.I. Lamp and Lighting Company showed their selected range of tungsten and fluorescent industrial and commercial lighting fittings for the first time. To further the company's intention to provide a really speedy service to the customer, this selected range of fittings has been carefully chosen to provide as comprehensive a range of equipment as it is possible to stock in quantities large enough to ensure "off the shelf" service throughout the country.

All the fittings in the selected range including a number of new fittings which have been specially designed to complete it, are illustrated in a special series of folders and are available from stock at over 45 distribution points.

Obituary

Mr. H. A. Deacon

MR. H. A. DEACON, the managing director of Cryselco Limited, died on May 8, 1956, at his home in Bedford after a short illness, at the age of 60 years. Mr. Deacon had many electrical interests and was at the time of his death Vice-Chairman of E.L.M.A. and Chairman of the Court of the E.I.B.A.

POSTSCRIPT By "Lumeritas"

A LOCAL branch of the National Council of Women is so concerned about the supposed injurious effects of fluorescent lighting that it has drafted a resolution on the subject which it hopes will be transmitted to the Minister of Health. This is the resolution: "The N.C.W. of Great Britain view with apprehension the ever-increasing use of fluorescent lighting in offices, shops and factories, where for long periods workers are obliged to use artificial light. Believing that the strain caused by the enforced use of this shadowless lighting, both on those with normal and defective sight, is one of the chief contributory factors in the increase in nervous disorders of the eye, the N.C.W. in conference assembled urges Her Majesty's Minister of Health to set up an inquiry in order to ascertain if there is sufficient evidence to support this view."

Such a resolution deserves some comment: it cannot be dismissed lightly, for either it is the outcome of some real difficulty or discomfort experienced by those who passed it, or of some misconception about fluorescent lighting. My first comment is that the resolution appears to beg the question, for it states that there is an "increase in nervous disorders of the eye," and then asks for an inquiry to ascertain if this is so. And what is meant by "nervous disorders of the eye"? Secondly, the reason given for the strain and the eye disorders "caused by" fluorescent lighting is simply the absence of shadows. However, fluorescent lighting is not inherently shadowless, although for certain uses, e.g., in drawing offices, installations are often so designed as to eliminate shadows a far as possible. According to a certain "expert," to whose opinions I have referred more than once, shadowless lighting is ideal anyway (provided it is not also fluorescent!), but evidently this opinion is not shared by the N.C.W. In fact, I think that some fluorescent lighting installations are unsuitable, because the softening of shadows is overdone, but this is a fault of installation design and not of the light sources themselves.

The complaint of the N.C.W. seems to me to be an expression of dissatisfaction with the uniformity of lighting, which is certainly an obvious feature of many interiors equipped with fluorescent installations. A plea for more diversity was put forward by Dr. Strange and Mr. Hewitt at the I.E.S. Summer Meeting last month, and when their paper is published I hope it will be widely read.

APROPOS the I.E.S. Summer Meeting, the menu for the banquet was enlivened by more or less apt quotations from various authors, "classical" and otherwise. The first of these came from the well-known Breakfast Table books by O. W. Holmes. It had nothing to do with lighting, but it recalled to my mind another passage from one of these books, viz.: "What a comfort a dull but kindly person is, to be sure, at times! *A ground-glass shade over a gas-lamp does not bring more solace to our dazzled eyes* than such a one to our minds." The italics are mine. The words were written, I believe, before Welsbach invented the gas mantle, so the brightness of gas-lamps was not then high, yet it was evidently regarded as dazzling. What would the Autocrat of the Breakfast Table have thought of the bare modern filament lamps which, as I remarked last month, are so easy to see in so many homes to-day? Despite the greater general brightness which these lamps provide, the brightness ratio of light-source and surrounds must often be higher than in the "good old days" of the Autocrat, yet, strange to say, it is tolerated night after night, year in and year out, by many people, some of whom complain of the ill effects of artificial lighting in their workplaces, where, nowadays, conditions are often better than at home!

AT a symposium on design of office buildings, recently held by the R.I.B.A., one of the subjects discussed was the effect of the development of fluorescent lighting. Because there is now an artificial source of light which is "capable of reproducing conditions very nearly as good as daylight," the architect is free to design thicker office blocks which provide more usable office area for the same circulation space, possibly with less site coverage. In fact, as Mr. John Bickerdike put it, the coming of fluorescent lighting represents a "milestone" in office development since it allows "the tremendous advantages in internal layout of planning in depth . . . this kind of planning was not feasible before the fluorescent lamp reached its present stage of development." It has also made possible much more liberal levels of illumination, but Mr. Bickerdike believes the time has come to consider carefully the impact which the new techniques and standards of artificial lighting are having or may have on building design and cost. Part of the answer to the problem of cost is to reduce the cost of fittings. "Here the lighting industry should take heed, for they are in danger of pricing themselves out of the market." This may be a timely warning, but can the lighting industry do very much about it when they—like the rest of us—are faced with continually rising costs? Can fittings of the kind and quality architects are likely to specify be produced cheaply?

THIS question of the price of fittings also arose at Harrogate in connection with the paper on Lighting Equipment and its Maintenance given by Mr. Mortimer Hawkins and Mr. C. J. Veness. The authors drew attention to certain advantages and difficulties arising from the design and construction of lighting equipment, and to what are desirable features from the viewpoint of the installation and maintenance contractor. There is no doubt that some of their points were well taken, but, as one or two speakers pointed out, we generally get what we pay for, and if we want fittings which leave little room for criticism the cost cannot be reduced to the level of "cheap and nasty" fittings.